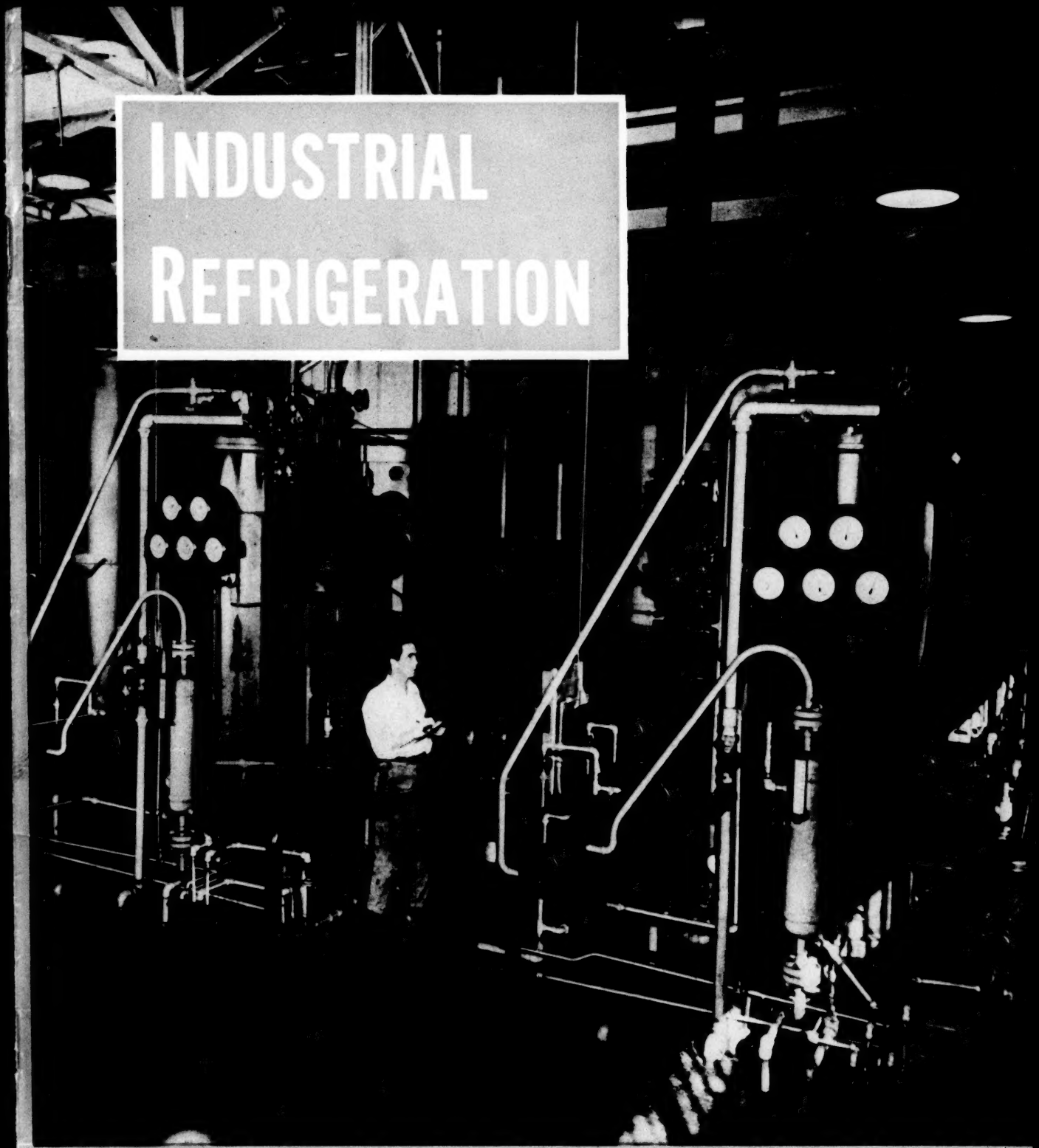

INDUSTRIAL REFRIGERATION

Formerly Ice and Refrigeration

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NOVEMBER, 1953

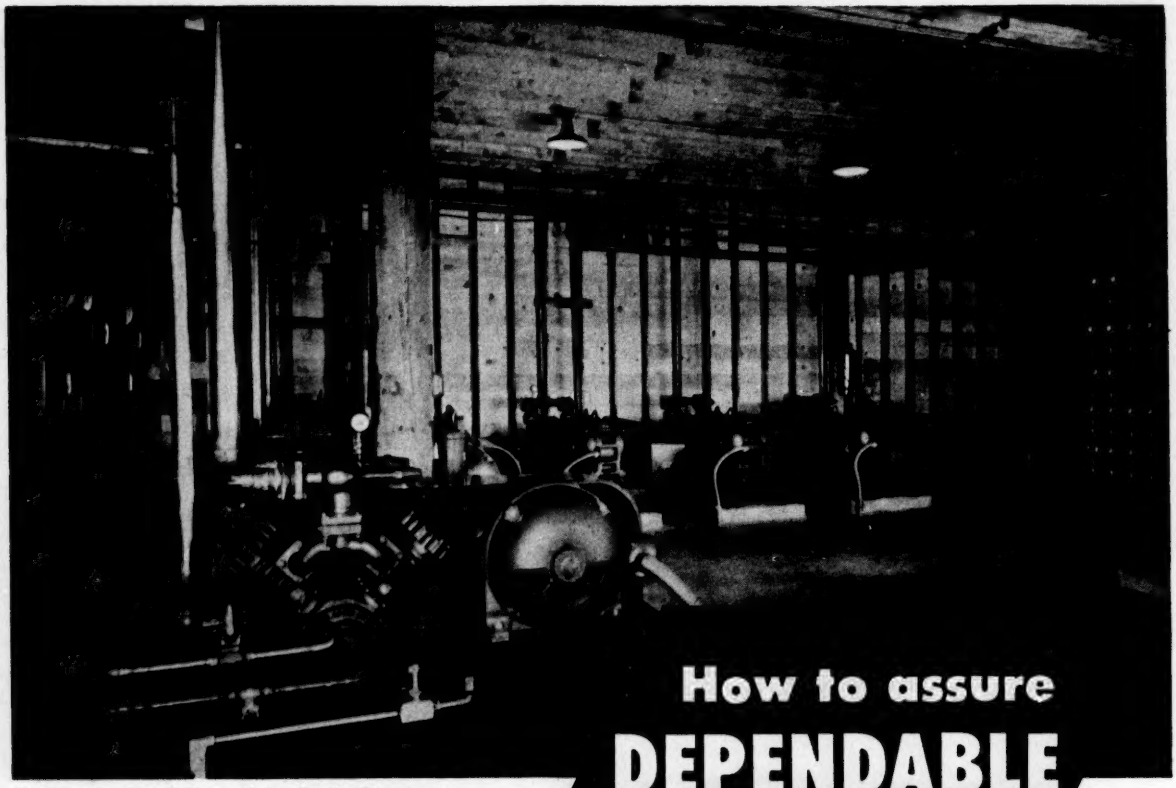


Photo courtesy General Electric Air Conditioning Department

How to assure DEPENDABLE LOW-COST compressor operation...

BEST ASSURANCE of keeping air conditioning compressors running efficiently is to lubricate them with the oil that *won't precipitate wax,* even in systems operating down to minus 100° F. That's *Texaco Capella Oil (Waxfree).*

Texaco Capella Oil (Waxfree) has exceptionally low haze and floc temperatures, outstanding stability and resistance to oxidation. It does not foam, is moisture-free, and will not react with refrigerants.

There is a complete line of *Texaco Capella Oil (Waxfree)* to meet the requirements of every type and size of compressor and all operating conditions. You can get them in 55-gallon and 5-gallon drums, 1-gallon cans, and the more widely used grades in 1-quart containers. All are *refinery-sealed* to protect purity and quality.

A Texaco Lubrication Engineer will gladly help you select the proper ones. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

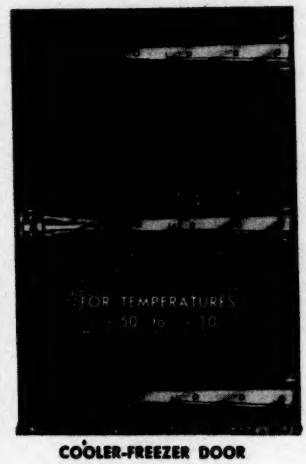
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

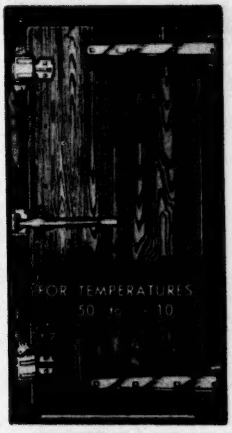
TEXACO Capella Oils (Waxfree)

FOR ALL REFRIGERATING AND AIR CONDITIONING COMPRESSORS

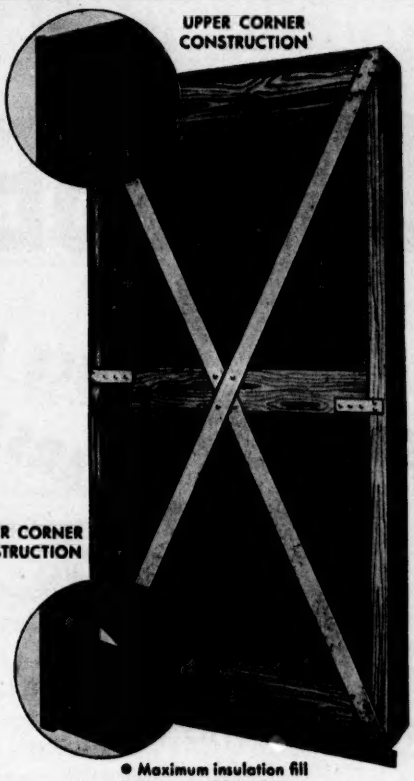
Circle No. 1 on Reader Service Card



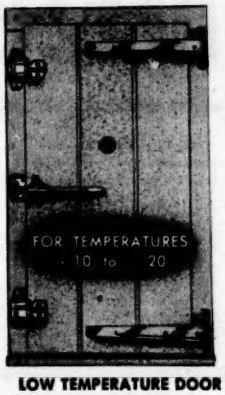
COOLER-FREEZER DOOR
- Modern streamlined job
- 100% "Douglas Fir"
- Sanitary hardware



X-52 PLYWOOD PANEL DOOR
- Plywood front and back
- Extra heavy-duty hardware
- Special type gaskets

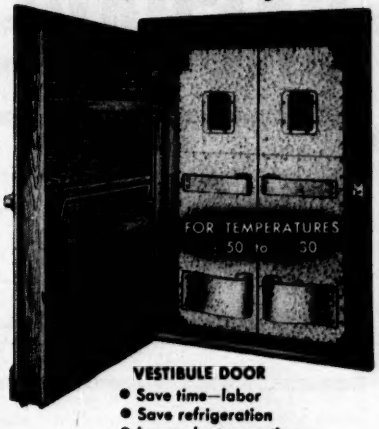


- Maximum insulation fill
- Most possible rigidity
- Allows reversal of swing



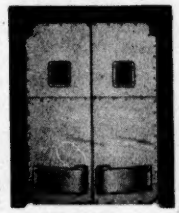
LOW TEMPERATURE DOOR
- Entire metal-clad front
- Extra heavy-duty hardware
- Special type gaskets

SUPER FREEZER (OVER-LAP) DOOR
- Extra-heavy construction
- Extra-heavy duty gaskets
- Extra heavy-duty hardware

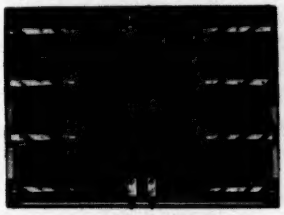


VESTIBULE DOOR
- Save time—labor
- Save refrigeration
- Large plant operation

TRACK DOOR
- For abattoirs
- Meat handling rails
- Banana rooms



AUTO-CLOSE DOOR
- For loading dock
- Intra-cooler doors
- Heavy trucking



DOUBLE DOOR
- For palletizing
- For carloading
- For elevator shafts

BUTCHER BOY REFRIGERATOR DOOR CO. • HARVARD, ILL.

Circle No. 2 on Reader Service Card

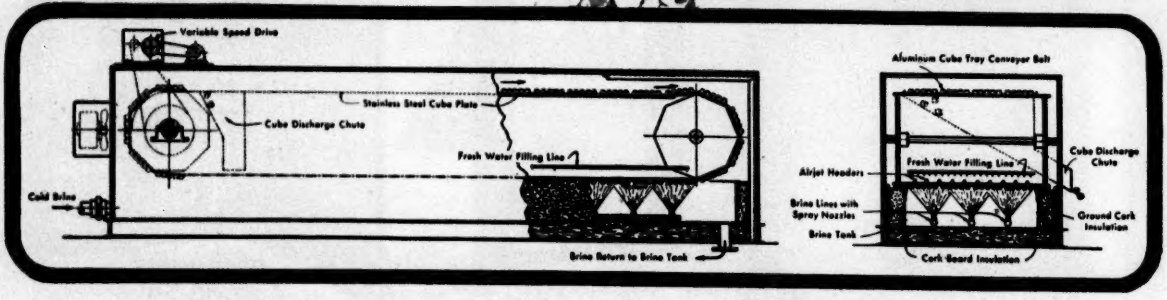
COME SEE IT!

THE GREATEST ICE NEWS IN YEARS!!

...first public working demonstration at the National Association of Ice Industries Convention, Hotel Statler, Washington, D.C., Nov. 17-20.

GIFFORD-WOOD
presents the

"CASCADE" ICE CUBE FREEZER



A "package unit", the G-W "Cascade" Cuber fast freezes clear, clean solid cubes in about 35 minutes, using brine from existing freezing tanks. Installation is easy *and* economical — no foundations, no special building — requires only some 80 sq. ft. of floor space.

You can make 5 tons of perfect cubes per day at far less cost than the block ice method — in approximately 40% of the space required for a 5-ton can tank and a saw-type cuber.

You *SAVE* all these with the G-W "Cascade" Cuber:

LABOR COST — for ice-pulling and saw-cubing.

POWER — for cranes, agitators, block conveyors, elevators.

MATERIAL — no ice chip or sawdust losses.

FLOOR SPACE — no extra bulk, will fit *every* ice plant.

MAINTENANCE — cubes are manufactured *automatically*.

THESE SAVINGS ARE *YOUR PROFIT!*

GIFFORD-WOOD CO.

Since 1814
Hudson, New York

New York 17, N. Y. — 420 Lexington Ave.
St. Louis 1, Mo. — Railway Exchange Bldg.
Chicago 6, Ill. — 565 W. Washington St.

It's **ECONOMICAL**... requires *less* motor horse power.
It's **SANITARY**... cubes are never touched by human hands
and it's **AVAILABLE NOW**... see it at the Convention!

3377

Circle No. 3 on Reader Service Card

LETTERS

(Letters to the editor are welcomed from readers of INDUSTRIAL REFRIGERATION on any subject of general interest.)

Chicago, Ill.

I had the opportunity yesterday to look over a copy of the new "INDUSTRIAL REFRIGERATION", which I think is a splendid achievement. The new cover is more modern than any I have seen in many a year on a trade journal, and I particularly like the manner in which you handled the tie-in with the book's predecessor "Ice and Refrigeration". You seem to have diversified the interior of the book, not only with modern versatile layouts, varying the column widths, etc., but the editorial content as well leaves nothing to be desired. If you keep this same high level, I am sure the book will maintain its place as leader of the field.

H. D. NORTHROP
American Hair & Felt Co.

Detroit, Mich.

Am writing to tell you that in my opinion you have done a really outstanding job in modernizing our old friend of many years. I was very much impressed with the new cover. It is still I & R—a name that has a host of friends among refrigerating engineers all over this country. Many thanks for the fine write up of Mr. Bright's paper describing Pfeiffer Brewing Company's plant. Sincerely hoping that this change will accomplish all that you have hoped for in making more friends as well as additional financial rewards, I am, with all good wishes. — C. M. GILBERT,
Pfeiffer Brewing Co.

Phoenix, Ariz.

We wish to thank you for the nice write-up in July "Ice & Refrigeration" about our new cold storage. We have had a few people from distant parts of the country stop in and see us as a result of the pictures, especially interested in car unloading hood.—F. E. WILIE
Crystal Ice & Cold Storage

New York, N. Y.

This publication of INDUSTRIAL REFRIGERATION is greatly appreciated.—JOHN C. BANYARD
Hotel Carlyle

Pittsburgh, Pa.

I have just finished reading your September issue and have enjoyed reading every page. You do have a mighty fine publication and I shall look forward to each issue. I thought you might like knowing one engineer's opinion, thus this letter. If in the future I can help either you or your publication please feel free to call upon me.—FRANCIS A. YOST
Pittsburgh Corning Corp.

Industrial Refrigeration

formerly ICE AND REFRIGERATION

Now in its 62nd Year of Publication

J. F. NICKERSON, FOUNDER

VOL. 125 NOVEMBER, 1953 NUMBER 5

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The Cover:

• Duplicate compressor systems in the nitrogen-liquefaction plant of the NBS-AEC Cryogenic Engineering Laboratory. Air drawn in from the roof of the plant is compressed in five stages to a pressure of 3000 lb/in². The two large cylindrical tanks in the foreground contain cooling systems for the compressors. The tall cylindrical tanks in the background are caustic purifiers, through which the air is run between the second and third compression stages for removal of carbon dioxide. At the extreme left is the air expansion engine of one of the nitrogen liquefiers, and slightly to the right of the engine is a combination liquefier and fractionation column. Article on page 17.

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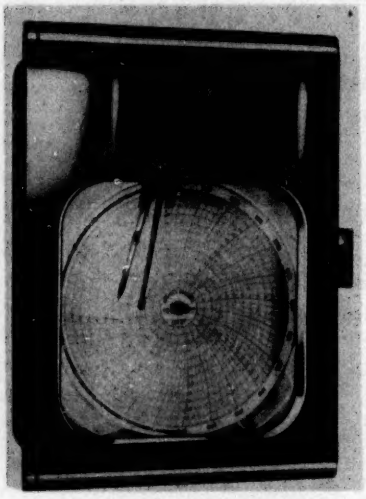
What's New

MACHINERY
APPLIANCES • PROCESSES

For your convenience in securing additional information on any product desired, use the convenient Reader Inquiry Card.

Electronic Controllers

A NEW line of Free-Vane Electronic Controllers has been announced by The Bristol Company. The new instruments are part of the Series 500 line, and are available as indicating or recording controllers for temperature, pressure, flow, liquid level, humidity and time program control. They use the standard Bristol measuring elements.



The new Bristol Electronic Controller

Based on a unique frequency modulation principle, the Free-Vane Controllers are offered for low-open, high-open, low-high, low-open-high or low-normal-high control, as well as proportional input control. Various combinations of one or two recording pens or indicators with one or two control units in one case make the new controllers adaptable to a wide range of control problems.

For additional information, circle 54 on Reader Inquiry Card.

Water Treating Products

THREE new water conditioning products designed to help maintain the efficiency of water cooling equipment in air conditioning systems have been developed by the Garman Company, Inc. All three are being marketed under the trade name Vapco.

The first, known as Vapco Preventive, is for use in new water cooling equipment, or old equipment which has been conditioned by the other two Vapco products, Vapco Slime-X and Vapco Cleaner. Its purpose is to keep condensers clean and operating at top efficiency.

Vapco Preventive is entirely new in principle and operation. Vapco "complexes" (inactivates) the solids usually found in water and holds them in solution to be drained off naturally once each month and not deposited on metal surfaces of equipment or as a sludge in the sump tank. It also contains chemicals to inhibit slime and algae growth and to prevent corrosion.

Vapco Slime-X is for use as a "shock" treatment to kill slime bacteria and algae growth. Whenever slime bacteria, fungi or algae propagate in an evaporative condenser or cooling tower, one specie predominates. Each specie exhibits a toxic dose to an algaecide, fungicide or bactericide. The proper treatment to eliminate such organic growth from the system is to perform "shock" treatment, application of a bactericide, fungicide or algaecide.

The other Vapco product, Vapco Cleaner, is an acid type salt designed to remove scale and other incrustants which may have accumulated on equipment through lack of proper water treatment thus permitting safety and ease of handling.

For additional information circle 69 on Reader Inquiry Card.

Stainless Steel Solder

DEVELOPMENT of a new high capillary silver-bearing stainless steel solder which is applicable with a soldering iron or torch at 430 F has been announced by All-State Welding Alloys Co., Inc., White Plains, New York. It has long been recognized, the company said, that on a wide variety of work, particularly on steel, stainless steel, copper, and nickel alloys, a stronger "soft" solder would greatly reduce the need for the costlier materials and methods of brazing. Field tests have demonstrated that the new silver-bearing stainless steel solder has gone far in that direction. Claims are that it costs much less than the silver brazing alloys, is easier and cheaper to apply, and that it has somewhat the same affinity for all metals. Also it compares favorably with other silver alloys in its adaptability to standard manufacturing, installation and maintenance procedures.

For additional information, circle 62 on Reader Inquiry Card.

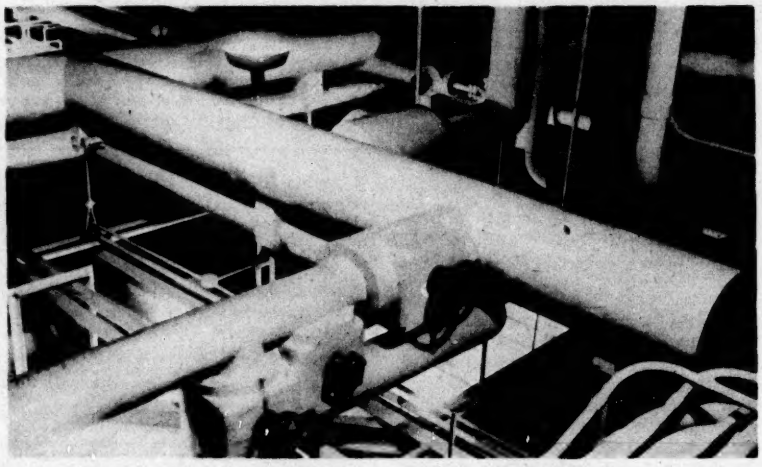
Vapo-Wall Pipe Insulation Made From Styrofoam

VAPO-WALL, pipe insulation fabricated by MMM, Inc. of Houston, Texas, is made from Styrofoam, an expanded polystyrene manufactured by Dow Chemical Company. Styrofoam has many qualities which make it exceptionally practical for use in low-temperature insulation. Of chief interest are the facts that it is moisture-proof, it is its own vapor barrier, it has a permanent 'K' factor of .23 to .25, it offers effective insulation from sub-zero temperatures to 190 F, and it remains unaffected by sudden temperature changes.

Other outstanding specifications include an average density of 2.00 pounds per square foot, making it the lightest of all rigid-type insulating materials; a compression strength of 25 pounds per square inch; plus the qualities of being sanitary, moldproof, rot- and vermin-resistant. It will not deteriorate in service under normal conditions and will last indefinitely if properly installed.

This material is immediately available in all common sizes of pipe and fitting covers in light, standard and heavy-duty thicknesses, and special sizes can be fabricated promptly upon request.

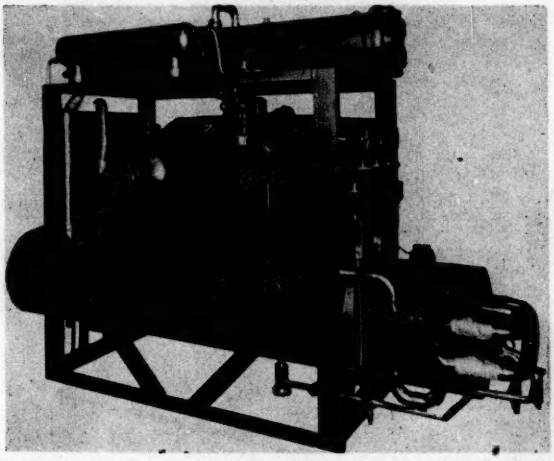
For additional information, Circle 73 on Reader Inquiry Card.



Typical Vapo-Wall installation. The 10-inch pipe, center, in a large dairy plant was insulated with standard-duty Vapo-Wall of 3-inch thickness, and the entire installation covered with asbestos cement.

New Package Water Chiller

A NEW line of package water chillers from 5 to 60 hp is now being manufactured by Schnacke, Inc., Evansville, Ind., to meet the increasing demand for this type of equipment. These units include compressor, chiller, water cooled condenser, all controls, starter, piping, etc., com-



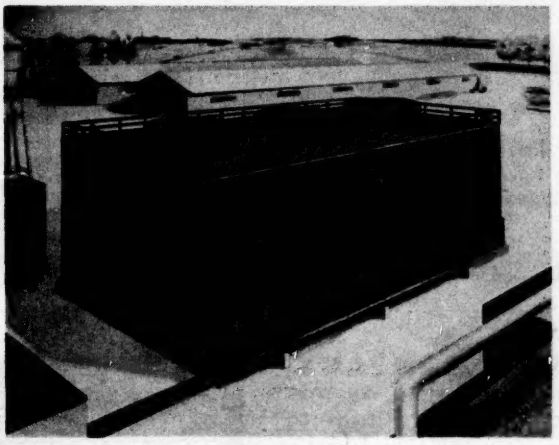
New package water chiller by Schnacke. Illustration shows 20 ton completely assembled water chiller and is an example of the line now available from 6 to 60 hp.

pletely assembled and ready to start with the connection of power, condenser water and chilled water lines. It eliminates a great deal of the expensive field labor cost. It also eliminates many of the hazards encountered with inexperienced and careless field labor, wrong piping installation, dirt, moisture, foreign matter in the system, etc. **For additional information, Circle 72 on Reader Inquiry Card.**

New Cooling Tower Design

A FORWARD step has been taken by the Santa Fe Tank & Tower Company, Los Angeles toward developing a cooling tower with a substantially improved construction design. The newly designed tower is said to require fewer parts for construction, which in turn, allows for faster erection and less maintenance.

Santa Fe engineers branded their new tower the "MD-54", which is the result of a series of laboratory and field tests that measured all performance factors in relation to its new structural features. Simplified construction and



Architect's drawing of building with cooling tower installation on roof.

WHICH DO YOU NEED?

INDICATORS—

TAYLOR DIAL THERMOMETERS

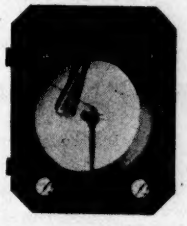
For **cold storage rooms, bunker rooms, brine tanks** and other applications where periodic reference is required and a continuous record is not considered essential.

RECORDERS—

PORTABLE RECORDING THERMOMETER

For **storage rooms, processing rooms, refrigerating rooms,** etc. A self-contained Taylor Recording Thermometer to check air temperatures in various rooms.

CONTROLLERS—



TAYLOR FULSCOPE CONTROLLER

For **tanks, brine lines, compressors,** etc. Probably the most versatile instrument made for temperature, pressure, flow and liquid level control. Easily adaptable to any operating conditions.

TAYLOR'S CATALOG FOR REFRIGERATION INDUSTRY

Write today for Taylor's Catalog 300, giving details on how these instruments, and many more, can cut costs, give new efficiency on refrigeration problems. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

Circle No. 4 on Reader Service Card

In planning or estimating low temperature refrigeration...

CUT COSTS 5 WAYS with

PALCO INSULATION WOOL

SEND FOR FREE ESTIMATOR'S DATA SHEETS which provide a method for determining complete costs of various types of Palco insulated structures.

- **Save COST OF MATERIAL** – Palco Wool Insulation costs less for comparable efficiency, and offers higher insulation value per dollar invested.
- **Save COST OF INSTALLING** – Easy to install, saves man hours. Light weight and non-settlement allows economical design for further savings.
- **Save COST OF POWER** – Permanent high insulating efficiency plus economical use of added thickness cuts power requirements up to 10%, also decreases wear on equipment.
- **Save COST OF REPLACEMENT** – Properly installed, Palco Wool stays dry, maintains peak efficiency permanently, never deteriorates, needs no replacement.
- **Save LOWER INVESTMENT AND INTEREST** – Lower initial cost means lower investment, lower interest, lower depreciation, bigger profits from the start, maintained higher income.

Send for Free Sample of PALCO WOOL for your own inspection

THE PACIFIC LUMBER COMPANY
100 BUSH STREET, SAN FRANCISCO 4, CALIFORNIA
35 EAST WACKER DRIVE, CHICAGO 1, ILLINOIS

PALCO INSULATION WOOL

Circle No. 5 on Reader Service Card

New Equipment – Continued

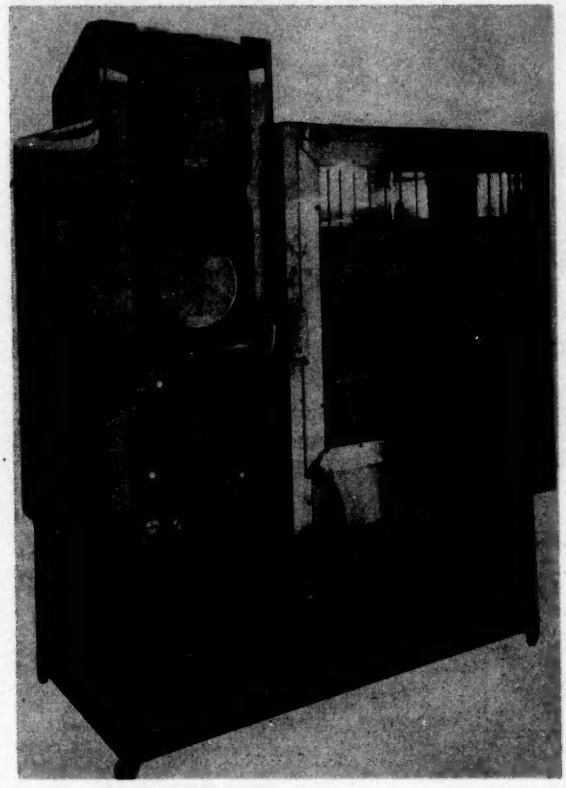
better utilization of materials in the "MD-54" is the key to the new design and improved performance.

Two separate and distinct standard types of wetted surfaces have been designed. After a series of extensive tests, it was found that one surface is best suited to lowest first cost, and the other surface to the lowest evaluated cost on an amortized basis. This makes it adaptable to meet the requirements of each individual plant. According to Santa Fe, the basic design allows for the largest possible range of size variations.

For additional information, circle 68 on Reader Inquiry card.

Atmosphere Control Cabinet

THE 15-CF Atmosphere Control Cabinet has been designed and built by The Package Materials Laboratories Inc. for moisture vapor testing within the limits of minus 20 to plus 200 F. with a relative humidity of 18 percent to slightly under 100 percent. This type of cabinet is used primarily for testing all types of foods,



15-CF Atmosphere Control Cabinet

greases, packaging materials, plastics, fabrics, tools, chemical, biological, metallurgical or pharmaceutical samples, or any materials which may be affected by temperature and/or humidity. It may be ordered equipped with conventional or electronic controls.

For additional information, circle 55 on Reader Inquiry Card.

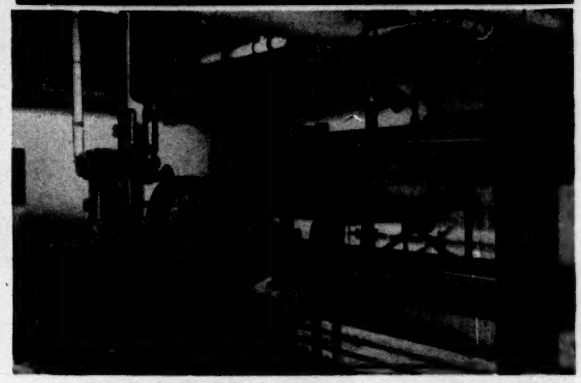
Safety Solvents

A NEW series of safety solvents has been introduced by Harco Chemical Co., Cranford, N. J. for cleaning greasy, oily and dirty machine parts and is also recommended for degreasing and cleaning electrical equipment. The solvents have flash points ranging from 140 to 280 F.

For further information, circle 61 on Reader Inquiry Card.

Prevent Profit-Eating Downtime

Here's HOWE



20-Ton Howe Ammonia Compressor—Veterans Hospital—San Fernando, Calif.
Distributor: Hugh Robinson & Son, Los Angeles

HOWE Standard Ammonia Compressors, to 150 tons, are built *right* from the start, thus averting costly downtime due to mechanical failure. Many users write us they have operated Howe units for 10, 15, even 25 consecutive years with surprisingly low operating costs. Efficiency from both a power and maintenance standpoint have been of prime importance for over 41 years at HOWE. For your "preventive maintenance" program, consult Howe engineers for replacement, remodeling, or an entirely new refrigeration system.

41 YEARS OF SPECIALIZATION INSURE SAVINGS

Since 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment.

Write for literature

HOWE ICE MACHINE CO.

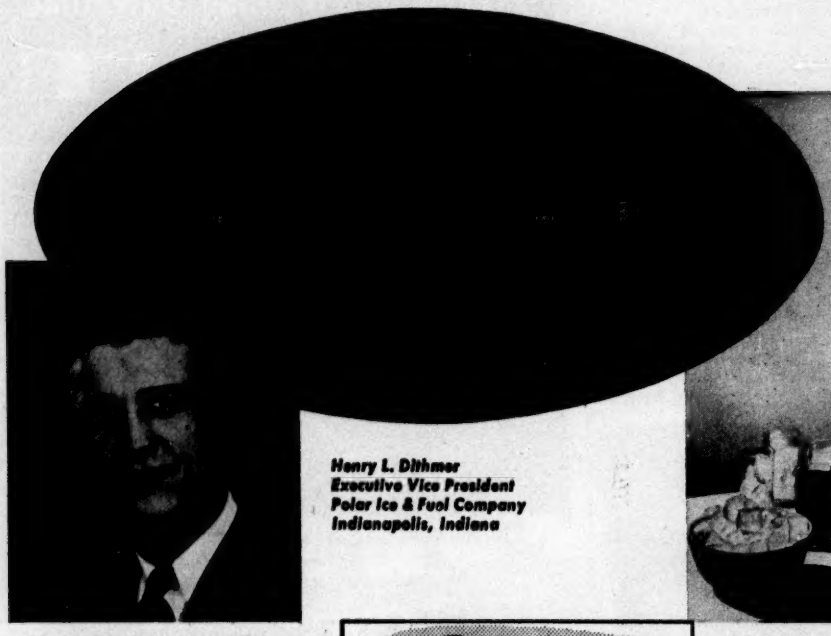
2829 MONTROSE AVENUE • CHICAGO 18, ILLINOIS

Distributors in Principal Cities • Cable Address: HIMCO, Chicago

Howe Polar Circle Coils Fish Freezer Storage.
Distributor: Euth Lambrecht, Detroit.

Circle No. 6 on Reader Service Card

TAKE A TIP FROM A MAN WHO'S MADE IT PAY



Henry L. Dithmer
Executive Vice President
Polar Ice & Fuel Company
Indianapolis, Indiana

Henry L. Dithmer tells you why Polar Ice & Fuel Company prefers Union Ice Bags: "We bought our first paper bags from Union in 1932 and now use almost 400,000 a year. Naturally when it became apparent that the most improved method of merchandising prepared ice was in wet strength bags, we again turned to Union. Their bags are tops in quality and appearance, and always are fairly priced."

PACKAGE ice in wet strength paper bags and take advantage of the opportunity to suggest additional uses on the sides and back of the bag. Turn good customers into "best" customers.

PAPER-BAGGED ice looks cleaner, is cleaner, Sanitary container invites both family and commercial users to keep cubes and cracked ice more readily available, use it more often.

SELL your brand name and telephone on your paper ice bag. Encourage "impulse" buying, special orders for parties. Ice bag advertising costs practically nothing — pays off big.

WIN new customers through attractive appearance of the container and by word-of-mouth recommendation. It's good business to make a good impression on your customer's neighbors.

Circle No. 7 on Reader Service Card

New Equipment—Continued

Freight Car Loading Ramp

A NEW hydraulic-powered dock ramp for use in the loading and unloading of freight cars is being presented by Beacon Machinery, Inc., East St. Louis, Ill. This ramp was designed to meet the specifications as set up by the railroads, and the switchmen's union, both of which state that "there shall be no protrusions above the level of the dock or beyond the edge of the dock during a switching operation."

Hydraulic-powered dock ramp installed in refrigerator car.

The unit is set within a pit 6 ft 10 in long by 2 ft 8½ in deep, with two widths, one 42 inches and the other 5 feet. In the retracted position the ramp is flush with the top of the dock and flush with the front edge of the dock. A secondary, or auxiliary ramp, moves outward from under the main ramp for a total horizontal travel of 48 inches and the ramp moves upward and downward a total of 24 inches. Standard unit has a maximum roll-over capacity of 12,000 lbs. Greater capacities can be furnished on special applications. Control is by means of electric push-button, mounted at any convenient point on the dock level.

For additional information, circle 51 on Reader Inquiry Card.

New Floor Sweeper

THE Plantman motorless industrial floor sweeper is now offered by Handling Devices Co., available with left and right hand side brush attachments. This increases the sweeping width by 12 inches and makes possible sweeping the angle of wall and floor in either direction.

This sweeper operates mechanically with no engine or motor. It is simply rolled along the floor by the operator. As the wheels rotate, a brush inside the sweeper revolves in opposite direction, whisking dirt, trash, dust and debris forward into a removable aluminum hopper.

A small Plantman equipped with left and right hand side brush attachments is capable of sweeping a 32 inch path at 20,000 square feet per hour. The new left hand side brush attachment can be added to most of the 10,000 Plantman Sweepers already in use.

Floor Sweeper Made by Handling Devices Co.

For additional information, Circle 70 on Reader Inquiry Card.

Pipe Wrench

A WRENCH with a vise-like grip, and which cannot mar chrome pipe, is now available from Robert Austin Corporation, Boston, Mass. Adjustable to accommodate phosphor bronze jawlines to fit pipe dimensions from ½ inch to 1¼ inches, the wrench also locks in position, with a release lever which instantly opens the wrench and frees the pipe when desired. A knurled screw-adjustment tightens so that the phosphor bronze liners are set in position against inner studs, which prevents movement of the liners. Jaws adaptable for hex inserts to handle nuts and bolts. The wrench never slips on the pipe, once tightened, yet cannot mar or scratch the surface of the pipe it holds, and will not crush old piping.

For additional information Circle 64 on Reader Inquiry Card.

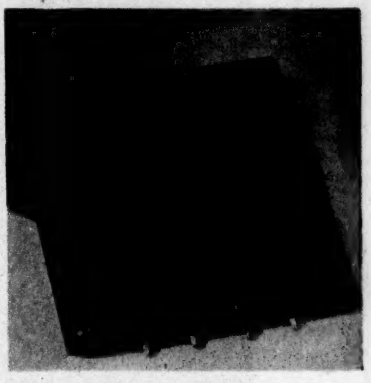
Develops Low-Pressure Rupture Disc from Gold

DEVELOPMENT of a low-pressure rupture disc from gold has been successfully accomplished, it is announced by Baker & Co., Inc., Newark, N.J. The company, a member of the Engelhard Industries group, is the world's largest refiner and worker of precious metals.

For additional information, circle 76 on Reader Inquiry Card.

Heat-Flow Transducer

HEAT-FLOW measuring instrument based on the new Beckman & Whitley Model 200 Heat-Flow Transducer can directly drive indicating or recording meters. This is possible because of the high linear electrical output relative to heat-flow gradient across the transducer. The high electrical output results from a large area-density of silver-constantan thermocouple junctions whose output can be connected in various physical and electrical configurations depending upon requirements.



Model 200 Heat-Flow Transducer

Based on a unit 3/64 by 4 1/2 by 4 1/2 inches containing from 180 to 720 junctions plus a thermocouple to check ambient temperature, the transducers are made in a range of sensitivities up to 6 btu/ft²/hr/mv. Each transducer weighs approximately one ounce and has thermopile and thermocouple terminals brought out to one edge.

Among the specific applications of the new transducers are total-hemispheric and net-exchange radiometers, portable heat-flow meters, and soil heat-flow recorders.

For additional information, circle 52 on Reader Inquiry Card.

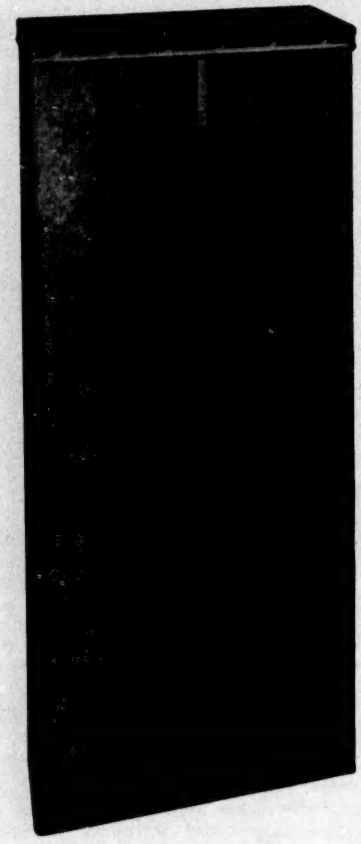
Humidity Closely Controlled in Plant

IN THE air conditioning plan, at Doehler-Jarvis, Toledo Plant, temperatures are governed so that persons, who frequently have to pass from conditioned factory spaces, do not experience a chill or shock caused by a continual readjustment to large temperature differences.

Automatically, the system maintains a temperature differential of only 5 F between conditioned and unconditioned spaces with a constant humidity level of 45 per cent relative humidity as the real comfort controlling factor.

A Kathabar humidity control unit automatically maintains the moisture content at 45 per cent by removing excess moisture from the air through the unique moisture absorption property of its lithium chloride base solution. The amount of dehumidification varies, dependent upon the delivered temperature required to maintain the 5 F differential.

For additional information, Circle No. 65 on Reader Inquiry Card.



Welded Cans
Integral Tube Cans
Arctic Pownall Cans
Can Baskets
Condenser Trough

• • • • • • • • • • •

Industrial Trucks and Trailers

THE OHIO GALVANIZING & MFG. CO.
NILES OHIO

Circle No. 8 on Reader Service Card

Press Briefs

Ten Cent Butter a Possibility

BUTTER at 10 cents a pound is a definite possibility in the near future according to a news report from Washington. Only the catch is that customers would have to buy one pound at the regular price and the second at 10 cents. Uncle Sam would foot the bill for the difference in the price of the second pound.

The program, still in the embryo stage, would benefit the dairy and creamery field as well as the refrigerated warehousing industry. Butter, which of late, has been moving at a pedestrian pace, would be quickly swept off the food shelves. Warehousemen would be busy for several months in disgorging from their warehouses the millions of pounds in accumulated storage.

Fresh butter would then move into the pipelines insuring both industries a steady source of continuing revenue from handling butter.

Ice Plant Closed and Dismantled

THE Creighton, Nebraska Ice plant which has been operated by the city for several years has been sold to the Creighton Co-operative Creamery. The plant will be dismantled. It was bought primarily for the compressor which will be used for the creamery's refrigeration system, replacing an older and smaller compressor. The plant has been operated at a loss of nearly $1,000 a year. About three years ago better and more automatic equipment was installed in the hope of reducing the labor expense but no satisfactory way was found to keep the plant on a self-sustaining basis so the decision was made last winter to close it up and sell the equipment.

Charges Infringement of Vacuum Cooling

THE Vacuum Cooling Co., filed a $200,000 damage suit in Federal Court in San Francisco, Calif., charging Bruce Church, Inc., of Salinas, Calif., with infringing on its patent, trade names and trade mark. Vacuum Cooling Co. claims that Bruce Church, Inc., an ice company, is using its patent in a cooling process employed by the Salinas firm.

Tax Amortization for Protective Construction

THE Office of Defense Mobilization has announced it will grant 100 percent tax amortization to companies undertaking "protective construction" of plants to reduce bomb damage in case of attack. "Protective construction" consists of sturdier buildings costing about 20 percent more than ordinary construction. To be eligible, the construction must involve at least $25,000 and be located in an area listed by civil defense as a "primary target area."

Defense Department May Reduce Competition

PROPOSED regulations establishing policies to take the Defense Department out of competition with private industry have been submitted to the Secretaries of the Army, Navy and Air Force. Any differences of opinion or objections by any of these services will have to be ironed out in special meetings, but if, all goes well, it is hoped the new policies can be approved and made effective by November 15.

Connecticut Regulates Frozen Food Storage

THE Connecticut legislature has approved a law requiring that frozen foods be stored and transported "under suitable refrigeration which shall insure good keeping qualities." The law is written in general terms and leaves to the Food and Drug Commissioner the determination of what constitutes "suitable refrigeration." It also requires the commissioner to hold public hearings before making his determination. Fines of $100 to $500 are imposed for violations.

Apple Warehouse Sold

THE big Y warehouse at Prosser, Wash., has been sold by the Yakima Fruit Growers Association to the Andrews Cold Storage Company of the Lower Valley community. It will be remodeled for use for low temperature storage. It was expected that the warehouse structure, with a storage capacity of 1,000 tons would be ready for use early in October. The freezing company will have a processing capacity volume of 50 tons daily and storage capacity of 1,800 tons.

New Cold Storage Plant

A new $500,000 cold storage plant has been built for Elmco Vineyards Inc. at Porterville, Calif., located on the Sante Fe line about six miles south of Porterville. The plant, completed last spring, will handle grapes primarily from the 1500 acre Elmco Vineyards in the Sucelito district. Other perishable crops also may be stored.

Refrigerated Potato Tariff Decreased in Canada

VEGETABLE shippers in the Maritime Provinces of Canada will this year receive free refrigeration service from Canadian railways. Both the Canadian National and Canadian Pacific have agreed to drop equipment charges for potatoes and other perishables, following protests from New Brunswick and Prince Edward Island marketing boards. The associations based their representations on changing transportation conditions, especially growing competition from other forms of transport. The extra cost of moving refrigerated carloads from the Maritimes to other parts of Canada had ranged from $5.95 per car for distances under 300 miles to $19.82 beyond 1,000 miles.

Cataract Ice Files Bankruptcy Petition

A VOLUNTARY petition for reorganization under Chapter X of the Bankruptcy Act has been filed in the Federal District Court at Buffalo, N.Y. by The Cataract Ice Company, Niagara Falls, N.Y.

William J. Williamson, president of the company explained that this action will give the company time to develop sufficient income to pay all claims at the earliest possible moment and that it is his intention to see that this is done. The situation, he says, is largely the result of a prolonged period of personal illness and its after effects.

Some time ago it was determined that they could best accomplish their purpose by leasing each department of the business to separate operators, with an overall supervisory connection. All this took much longer than anticipated, but they now feel that they have at least made some definite progress.

The ice plant, garage and store are under lease, and they have prospects of soon renting the other sections of the property, according to Mr. Williamson.

You can't take chances on your supply of crushed ice for protecting perishables. A Tri-Pak crusher-slinger will always give you crushed ice anytime . . . anywhere. These units are built in five models, both gasoline and electric powered, to give you the exact capacity you need at the lowest possible cost. Only two operators are required . . . one to slide full-sized blocks of ice into the crusher and the other to direct the slinger nozzle.

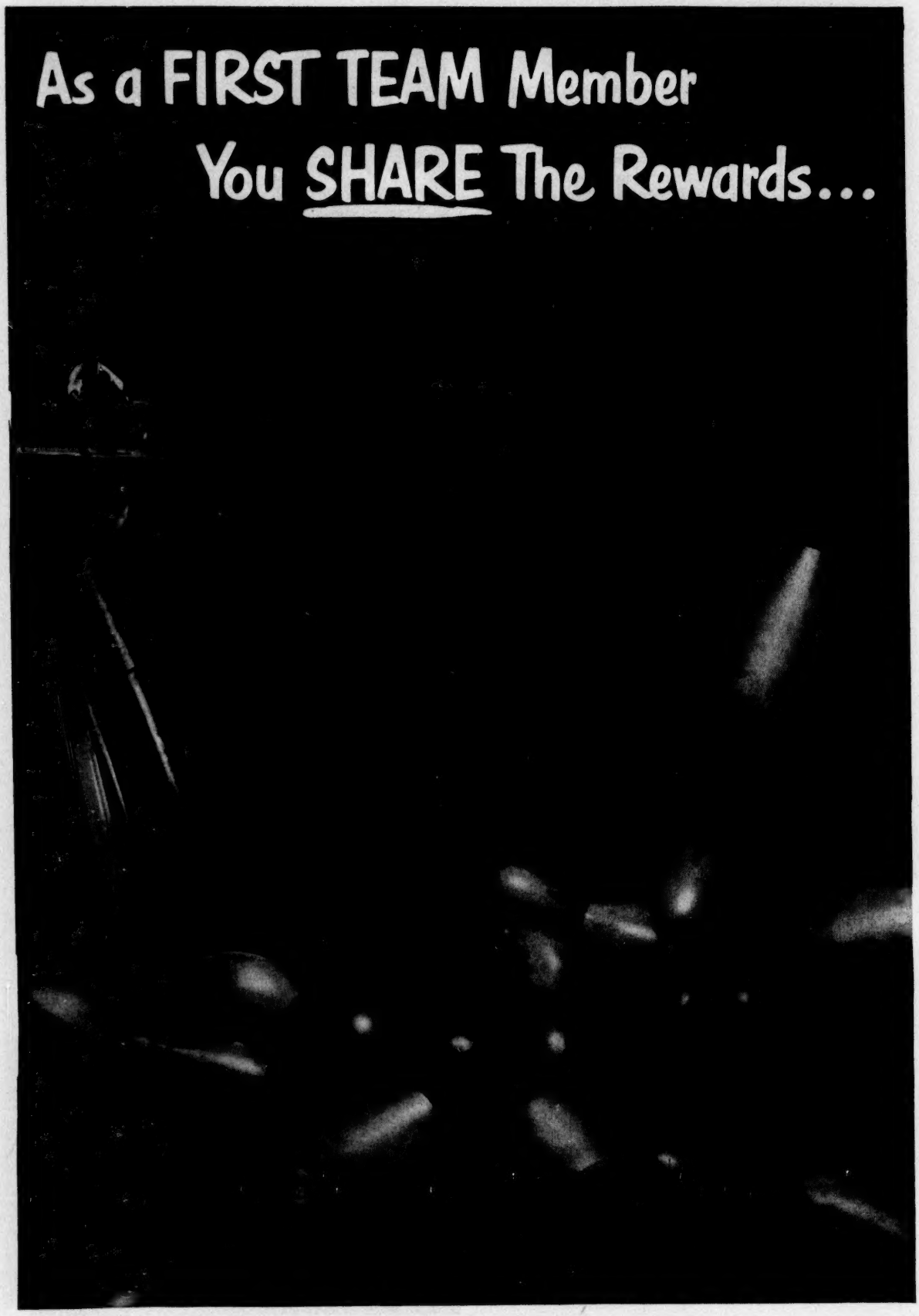
All Tri-Pak crusher-slingers are strongly built of welded steel to give you years and years of low-cost service. Rigid "X" frames carry the crusher and slinger and either a husky electric motor or a Ford industrial power unit. You can't match a Tri-Pak crusher-slinger for rugged, efficient operation.

TRI-PAK Machinery Service Inc.

Write today for your TRI-PAK BOOKLET which helps you select the crusher slinger you need.

HARLINGEN, TEXAS

Circle No. 9 on Reader Service Card


As a FIRST TEAM Member
You SHARE The Rewards...

What a wonderful feeling when your teammate "strikes" in the hot tempo of a closely contested match. Indeed, his skill and knowledge *count for you,* too!

So it is when you qualify as a *preferred* insurance risk and become a FIRST TEAMER under the Dodson Plan. You're *entitled* to share exclusive benefits and savings.

Bruce Dodson & Company is strictly a *service* organization maintained for just one purpose—to help you and other First Team risks get the most effective insurance coverage at lower cost. And the Dodson engineer who counsels you is an expert . . . a specialist in the insurance problems of your industry.

So we're really not asking you to "buy something." Instead we invite you on behalf of First Teamers in your industry, to get all the facts which will help you qualify for a share of the rewards.

We cordially invite your inquiry. Just clip the invitation below to your letterhead and mail. No obligation, of course.

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Gentlemen: I accept your invitation! I want to learn how the DODSON "FIRST TEAM" PLAN can improve my insurance protection at lower net cost to me. No obligation, of course, on my part.

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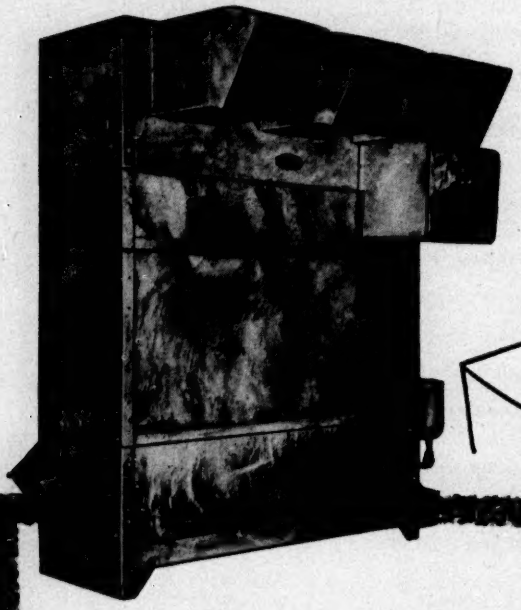
Your name here, please, then attach to your letterhead.

Circle No. 10 on Reader Service Card

No chinks in this armor!



Carrier Ammonia Evaporative Condensers are formed from heavy-gauge steel that is hot dip galvanized after parts are fabricated, not before. An extra-thick coating of zinc protects entire assemblies and complete sections. There are no chinks in the armor, no unprotected edges, holes, joints or sharp bends. Rust and corrosion can't get a foothold. As a result, Carrier evaporative condensers last years longer.

6 reasons why you're better off with Carrier Ammonia Evaporative Condensers:

Here are six features of Carrier Ammonia Evaporative Condensers that have proved practical in hundreds of installations:

1. A Carrier-designed centrifugal-type fan that works efficiently at a wide range of operating speeds. It's unusually quiet and is statically and dynamically balanced.

2. A cooling coil that's easy to get at, easy to flush and clean. The entire coil assembly is welded into a single unit then hot dip galvanized so you need never worry about rust or corrosion.

3. Easily removed 3-bend eliminators that keep moisture out of the fan section.

4. A chemical treatment unit that can be easily added for use in hard-water areas to prevent scale from forming on coil surfaces.

5. Casing sections made of heavy-gauge steel, die formed, welded into one piece, then hot dip galvanized.

6. A screened air inlet that can be located on either side of the unit.

There are other good reasons for selecting Carrier. Complete information about Carrier Ammonia Evaporative Condensers can be yours. Simply write Carrier Corporation, Syracuse, New York.

1. High-efficiency fan

2. Non-clog cooling coil

3. Triple-bend eliminator

4. Water treatment unit

5 Rugged casing

6. Two-way air inlet

Carrier

AMMONIA REFRIGERATING EQUIPMENT

Circle No. 11 on Reader Service Card

In the Spotlight

A LOW-TEMPERATURE engineering facility, known as the Cryogenic Engineering Laboratory has been installed at the National Bureau of Standards site at Boulder, Colorado. It will make possible large-scale production of liquefied gases not previously available in sufficient quantities for laboratory and industrial use. An illustrated description of this new facility is given in the article starting on page 17.

FOR MANUFACTURE of hygroscopic penicillin, American Cyanamid's Laboratories needed air dehumidification equipment to remove moisture from air. A lethium chloride base solution was used. For description and pictures see page 22.

A REVIEW of many different ideas and designs for cold storage building and equipment is presented in an article starting on page 23 by a registered professional engineer. The information will be of value to those who are contemplating new construction or remodeling.

A NEW FREEZER warehouse has been completed and is now in operation by the Pasco Packing Company, Dade City, Florida. It is one of the really large operations, with two and a half million cubic feet of space with capacity of 833 refrigerator car loads of frozen concentrate. For description and pictures, see page 34.

APPLE STORAGE houses in the Yakima Valley section of Washington, anticipating a substantially better crop than last year will have additional cold storage facilities totaling more than a half million box capacity. For details see story on page 36.

PUBLIC COOLER occupancy in refrigerated warehouses was up to 65 percent September 30, the same as a year ago, and two points above average for this time of year. Freezer occupancy increased by an above average, gain of three points. For additional details see full report on page 37.

CHANGES IN ice plant evaporators brought about increase in amount of ice produced. How this came about and details of the increases are told in a recent NAPRE convention paper, starting on page 40.

PURDUE PROFESSORS will highlight the program of the annual convention of the National Association of Practical Refrigerating Engineers to be held at Purdue University, Lafayette, Ind. November 10-13. For details see article on page 41.

PORTABLE extreme temperature conditioning boxes have been designed and installed at the Jefferson Proving Ground, Madison, Ind. to store ammunition. For description see page 50.

THE NATIONAL ICE Convention will be held at Washington, D. C. November 17-20. The program is being built around the theme "Sell More in '54," in support of which there will be a keynote speaker, panel discussions, reports from members of the association staff, and other features. An entertainment program will appeal to all. See page 51.

DIRECTORS of the National Association of Ice Industries met in July to discuss plans and to hear reports from various sections. A number of good merchandising ideas were presented. For brief report of the meeting see page 51.

READERS ASK—a new feature starts on page 54. Readers are invited to submit questions on operating or other details of plant or business. In this issue, insulating suction line and heat of motors are discussed.

STEAM at 1200 pounds per square inch and a temperature of 1000 F in the turbine of an electric generator, proposed by a Frenchman in 1924 was termed "Nervy" by Dean Emeritus E. A. Hitchcock in his autobiography "My 50 Years in Engineering." Now, less than thirty years later, nerve and science have united in planning a 120,000 kw turbo-generator for the Philco, Ohio plant of the Ohio Power Company to use steam at 1150 F and 4500 pounds per square inch, 50 degrees above the present top temperature and almost double the highest pressure that has previously been used. Such a pressure, above the "supercritical" 3206 pounds at which water passes directly into steam without any bubbling, means that the heavy boiler drum and reciprocating pumps will not be needed and especially high efficiencies can be obtained.

THE KIPLINGER Washington Letter has referred from time to time to the surplus butter situation. In answer to an article refering to "spoilage in storage," the following letter was received by the Washington office of the National Association of Refrigerated Warehouses:

"Thanks very much for setting us straight on butter storage. We knew that butter could be kept at least a year without any danger, but it was our impression that after that time it began to deteriorate in quality. We are certainly glad to know that it can be kept much longer, and that there is hope that this huge stock the government is now holding may eventually be consumed."

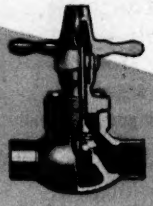
BORNEO'S first modern ice plant is in production at Pontianak. Its capital: 500,000 rupiahs.

Every Henry Valve, Drier and Strainer
is constantly being improved to retain
the confidence of the Air Conditioning
and Refrigeration Industry in the
complete line of Henry products.

HENRY

VALVES, DRIERS & STRAINERS

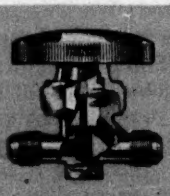
Relief Valve



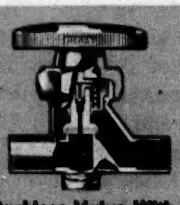
Wing Cap Valve

Drier

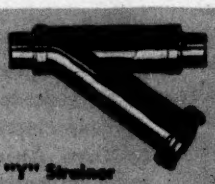
Ammonia Valve



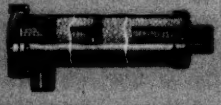
Packless Valve With Balanced-Action Blue Bantam Type



Packless Valve With Balanced-Action Standard Type



"Y" Strainer



Angle Type Drier

HENRY VALVE CO. CONTROLLING FLOW

Henry Valve Co.

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Cable: Hevalco, Melrose Park, Illinois

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Circle No. 12 on Reader Service Card

LOW TEMPERATURE FACILITY

Installation at Cryogenic Engineering Laboratory makes possible large-scale prodution of liquefid gases not previously available in sufficient quantities for laboratory and industrial use

A MAJOR low-temperature engineering facility, consisting of a liquid-hydrogen plant and a cryogenic laboratory, has been placed in operation at the National Bureau of Standards site at Boulder, Colorado. Known as the NBS-AEC Cryogenic[1] Engineering Laboratory, the new $3,500,000 installation makes possible large-scale production of liquefied gases which have not previously been available in sufficient quantity for laboratory and industrial development and testing.

The Cryogenic Engineering Laboratory was initiated by Dr. F. G. Brickwedde, chief of the NBS heat and power laboratories, and was designed under his direction, in cooperation with the Atomic Energy Commission, to provide facilities needed for the development and evaluation of cryogenic equipment for use at temperatures near absolute zero. The Bureau's long-standing program of fundamental research on the properties of liquid helium superconductivity, second sound, paramagnetism, and other phases of low-temperature physics remains at the NBS Washington laboratories.

Low-temperature activities at Boulder are carried on by a staff of 60 NBS personnel, under the supervision of R. B. Scott. Besides the production of liquid hydrogen and liquid nitrogen in unusually large quantities, a program of research and development, directed chiefly toward the improvement of low-temperature equipment, is well under way.

Low Temperature Liquefied Gases Used in Industry

Low-temperature liquefied gases-oxygen, hydrogen, and nitrogen — are finding increased application in industry and national defense, making necessary larger, more convenient, and less hazardous equipment for producing and handling these liquids. As a result, many new and highly complex engineering problems have arisen in the low-temperature field, where much remains to be learned about the behavior of engineering materials.

At liquid-hydrogen temperatures, normally trustworthy construction steel becomes brittle, rubbers lose their elasticity, and the mechanical properties of plastics are greatly altered. In general, there are such marked differences between the behavior of matter at ordinary and very low temperatures that the low-temperature properties cannot be obtained by extrapolation. The NBS-AEC Cryogenic Engineering Laboratory is investigating structural and other engineering properties of matter at low temperatures to provide the needed data and is developing more satisfactory materials and equipment for low-temperature use.

The Boulder installation is located on a 210-acre tract, the site also of the Bureau's large radio propagation laboratory now under construction. It consists of three principal units: a liquid hydrogen plant, a liquid nitrogen plant, and a group of laboratories for research and development. Two large concrete buildings —one housing the liquefying plants and the other for the experimental laboratories and shop—provide a total floor space of 34,000 square feet. There are also several auxiliary buildings and test sites.

Both major buildings are equipped with many safety and anti-explosion devices to minimize the hazards of working with liquid hydrogen in large quantities. The hydrogen liquefying and purifying equipment, which was designed and constructed by NBS, is in duplicate so that the plant can be operated continuously without shutdown. The experimental laboratories have been designed with emphasis on versatility in order to make possible continuing research in a variety of fields of science and engineering as the need arises.

Hydrogen Liquefaction

Liquid hydrogen — the lightest of all known liquids — has a density 1/14 that of water and boils just 20 Centigrade degrees above absolute zero at atmospheric pressure. Only liquid helium has a lower boiling point. Originally classed by Michael Faraday as a "permanent gas," hydrogen has such a low critical temperature (-240 C) that it was not liquefied until 1898. If at ordinary temperatures (above -80 C) hydrogen is allowed to expand through a throttling valve without doing external work—the so-called Joule-Thomson expansion—the result is not a cooling effect, as with most gases, but a heating effect. Evidently at temperatures above -80 C, known as the inversion temperature, the thermal energy lost by the expanding hydrogen gas (in overcoming the relatively slight forces of molecular attraction between the lightweight hydrogen molecules) is more than balanced by the heat produced as the expanding gas molecules push each other out of the way. Thus, in order to liquefy hydrogen by expansion, it must first be cooled below -80 C by some other means.

Cooling Hydrogen

Actually, the further hydrogen is cooled below the inversion temperature before expansion, the greater is the Joule-Thomson cooling effect. For this reason, in the NBS hydrogen liquefier the hydrogen, after first being compressed, is precooled with liquid nitrogen to as low a temperature as possible before the Joule-Thomson expansion. Liquefaction is then accomplished by allowing the compressed, cooled hydrogen to expand through the Joule - Thomson valve from a pressure of about 1800 lb/in^2 to atmospheric pressure. For maximum efficiency in cooling during the course of the process, extensive use is made of counterflow "heat exchangers", in which the high-pressure gas is called as it passes through many turns of coiled tubing surrounded by low-pressure colder gas moving in the opposite direction from a later stage of the liquefaction cycle.

[1] Cryogenic (from the ancient Greek kryos, icy cold) is an adjective meaning "very cold," or "at very low temperature".

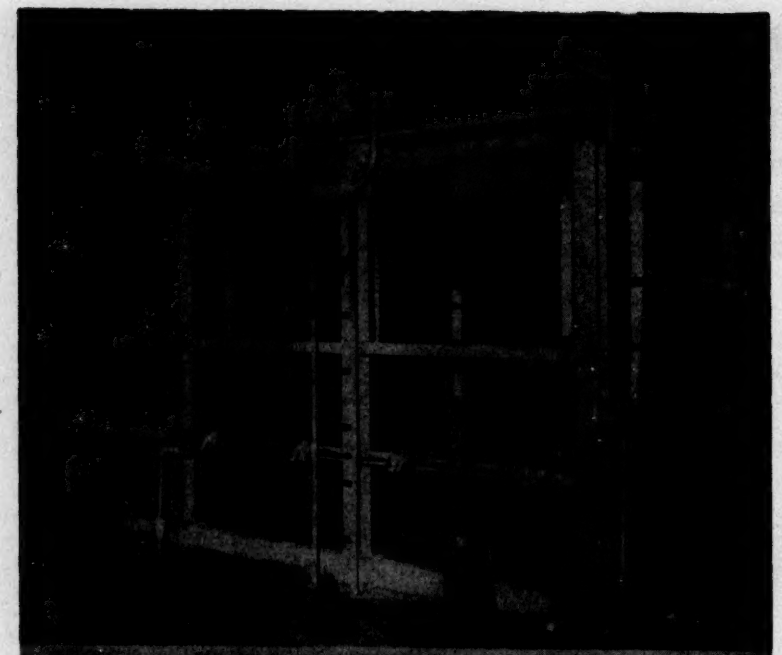


Fig. 1—(Left Top)—To insure continuous operation, the hydrogen liquefying and purifying equipment at the NBS-AEC Cryogenic Engineering Laboratory was constructed entirely in duplicate. This view shows one complete liquefying and purifying system (right of the central passageway) and a portion of the second system (at extreme left). Just right of the passageway is a 1000-liter metal dewar (30 inches internal diameter and 92 inches internal height), which surrounds the hydrogen liquefier with its heat exchangers and liquid-nitrogen precooling pot. To the right of the liquefying dewar is a second large dewar which surrounds a silica gel purifier for removing nitrogen impurity from the compressed hydrogen before liquefaction. To the right of this dewar is an alternate or "switch" purifier from which the dewar has been removed to expose a large coil (below), containing silica gel, and the heat exchanger above the coil. Because the silica gel most readily absorbs nitrogen at a low temperature, the coil is kept immersed in liquid nitrogen boiling at reduced pressure during operation of the plant. The tall cylindrical case behind and to the right of the open purifier contains a refrigeration drier, whose function is to remove water in the form of ice from the compressed hydrogen.

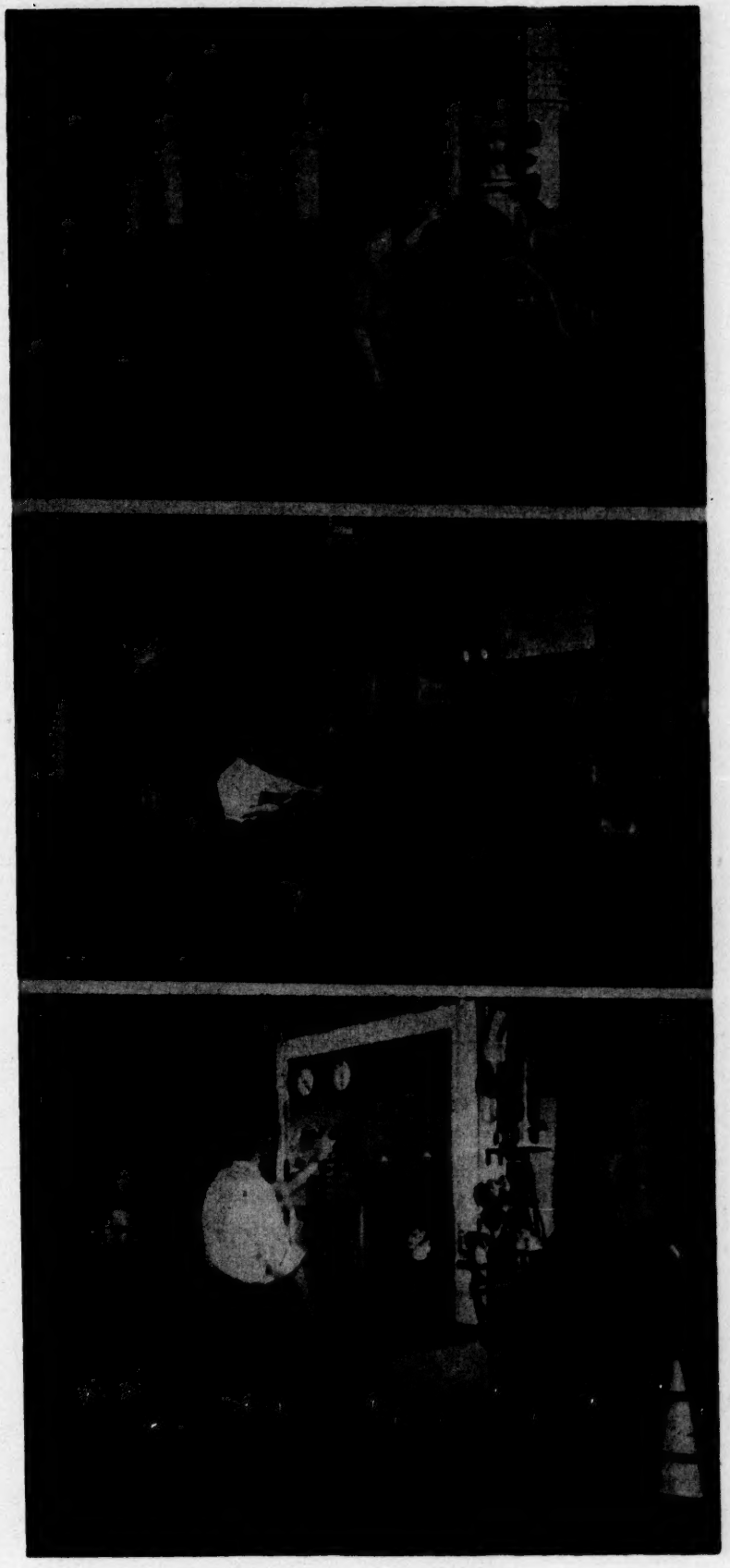
Fig. 2 — (Left Center) — Master panel board. The two sections at left are identical in function and are used alternatively, depending on which of the two liquefiers is in operation, to control the flow of hydrogen through the liquefier. The larger dials in these sections record and control the level of liquid hydrogen and liquid nitrogen in the liquefiers and purifiers, regulate presure, and record temperature. The smaller dials indicate pressure. The control for the Joule-Thomson expansion valve is the central of three valve controls located just beneath the row of four smaller dials. The end panel section (at right) contains additional temperature recorders, indicators to show the amount of gas in external gas holders, a system of lights to indicate those parts of the system which are in operation, and the controls for an emergency ventilating system. The portion of the panel board not shown contains the controls and indicating dials for devices which determine oxygen and nitrogen content of hydrogen.

Fig. 3—(Left Bottom)—Three hydrogen compressors. Each compressor takes hydrogen gas from a low-pressure supply at 0.75 lb/in² and compresses it to 2000 lb/in². The compressors require 125 horsepower, are four-stage, and are water-cooled. Victor J. Johnson, project leader for plant operations, is standing in front of a bank of air-operated selector valves which connect the compressors to either of the two hydrogen liquefying systems.

Fig. 4—(Right Top)—Large reciprocating vacuum pumps. These pumps are used to reduce the boiling pressure—and hence the temperature—within the liquid-nitrogen precooler. Dean B. Berky of the NBS staff is opening the vacuum beaker on the first of the three vacuum pumps.

Fig. 5—(Right Center)—The liquefaction plant of the NBS-AEC Cryogenic Engineering Laboratory contains two complete liquid-nitrogen generators which separate nitrogen from the air and liquefy it. John E. Schrodt of the NBS staff is standing in front of one of the units, the other is to his left. Within the large cylindrical metal case is a combination liquefier and liquid-air distillation column which removes oxygen from the liquid-air mixture. To the right of the large column is an air-expansion engine. Air entering the engine at about 0°C and 3000 lb/in² expands to 70 lb/in². In the course of the expansion, the gas does work against reciprocating pistons, and the energy thus lost results in a lowering of its temperature. The smaller-diameter tank at the extreme left contains activated alumina for removal of moisture from the air at an early stage of the liquefaction cycle.

Fig. 6—(Right Bottom)—Equipment developed by the NBS-AEC Cryogenic Engineering Laboratory for study of the mechanical properties of metals at very low temperatures. The specimen, surrounded by refrigerants, is supported within a cryostat behind the panel board and is subjected to tensile stress by a hydraulic system, the upper end of which is visible above the panel board. Stress, strain, and temperature measurements are being obtained from the instruments on the panel board.



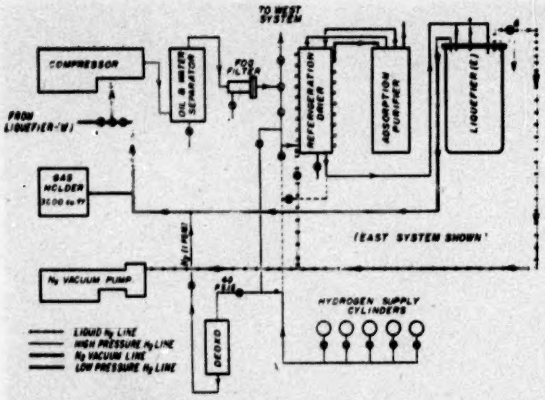


Fig. 7—Flow diagram of the hydrogen liquefier at the NBS-AEC Cryogenic Engineering Laboratory.

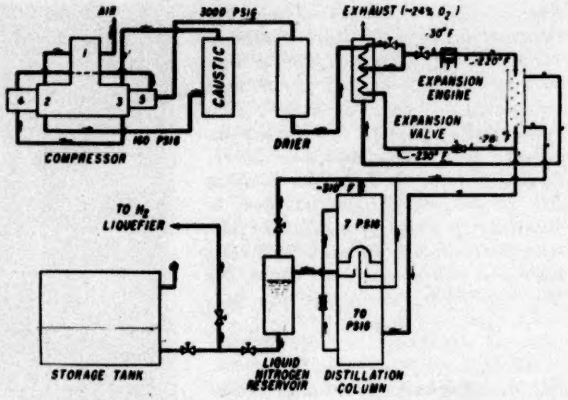


Fig. 8—Flow diagram of the nitrogen liquefier at the NBS-AEC Cryogenic Engineering Laboratory.

Commercial Hydrogen

Commercial hydrogen is transported to the NBS plant for liquefaction in mobile tube tanks. The hydrogen is stored in these and in similar stationary tube banks at the Laboratory at a pressure of 2100 to 2400 lb/in² until needed in the plant. From the storage tubes, the gas flows at reduced pressure (25 to 50 lb/in²) through a tank containing a palladium catalyst, which removes small amounts of oxygen (by promoting the $O+H_2=H_2O$ reaction), and then to water-cooled four-stage compressors. Two 3000-cu ft gas holders in the line between the deoxidizing equipment and the compressors provide a ballast for operation of the plant and also serve to maintain a small pressure in the line.

Leaving the compressors at room temperature and a pressure of about 2000 lb./in², the gas is next purified by means of a system consisting of oil-water separators to remove suspended liquid, a refrigeration drier to remove water and oil vapor, and an adsorption purifier of silica gel cooled to liquid nitrogen temperature for removal of nitrogen and other gases. After the purified hydrogen has given up some of its heat energy in passing through counterflow heat exchangers, further cooling is attained in the liquid-nitrogen precooler, where the hydrogen passes through coiled tubing immersed in liquid nitrogen boiling at reduced pressure. From the precooler, the gas passes through a final heat exchanger and then through the Joule-Thomson expansion valve, where part of the hydrogen is liquefied by the expansion.

Upon leaving the liquefier, the liquid hydrogen is transferred into storage containers through specially designed vacuum-insulated transfer lines. These "pipelines" have been used to carry the liquid 50 ft. or more, and it appears likely that this distance can be greatly extended if desired.

Hydrogen Liquefier

The NBS hydrogen liquefier is unique in that all the heat exchangers as well as the liquid-nitrogen precooler are contained in a single large vacuum-insulated metal dewar having an internal length of 7.5 ft. and an internal diameter of 2.5 ft. An identical dewar surrounds the silica-gel adsorption purifier. Inasmuch as the hydrogen liquefying equipment is in duplicate and each liquefier is provided with two silica-gel purifiers for alternate use, the hydrogen plant contains six of the large dewars altogether.

The upper two-thirds of the liquefier dewar contains three heat exchangers and the liquid nitrogen precooler. These heat exchangers are in parallel and are equipped with adjusting valves which permit distribution of the flow of entering hydrogen between the exchangers in such a way as to obtain maximum efficiency in the cooling process. The lower third of the liquefier dewar serves as the liquid hydrogen collection pot. It also contains the final heat exchanger and the Joule-Thomson expansion valve. The portion of the hydrogen which was cooled but not liquefied in passing through the expansion valve is used as a refrigerant in the final heat exchanger and in one of the initial heat exchangers, while the liquid nitrogen vapor from the precooler is the refrigerant in the other two heat exchangers.

The refrigeration drier and silica-gel adsorption purifier are arranged as a unit. Hydrogen gas enters the drier case at room temperature and passes over heat exchanger tubes where it is cooled by outflowing gas inside the tubes. The water and oil impurities are condensed out as the gas flows through the drier toward the nitrogen purifier. The gas is finally cooled to liquid nitrogen temperature by passing through a coil submersed in liquid nitrogen in the purifier dewar. At this temperature nitrogen gas present as an impurity in the hydrogen is readily adsorbed by the silica gel as it flows through the silica-gel coil.

For efficiency and convenience of operation, the hydrogen liquefaction system is extensively equipped with automatic instruments, recording devices and servo-mechanisms. For example, level indicators[2] and controllers developed by NBS measure the liquid-hydrogen level and automatically maintain the proper level of liquid nitrogen in the adsorption purifier dewar and in the precooler. An automatic control instrument regulates throttle valves in the vacuum pumping lines to keep the pressure over the pots of boiling liquid nitrogen just above the triple point for maximum cooling without freezing the nitrogen.

Another automatic instrument controls the level of hydrogen within the gas holders; thus insuring that new hydrogen gas flows into the system at the same rate as liquid hydrogen is taken out. The nitrogen content of the hydrogen is measured by a thermal-conductivity apparatus, developed in the Chemistry Division of NBS. Finally, whenever a part of the liquefaction plant is not operating properly, a general annunciation system rings a bell and flashes

[2] A liquid level indicator for condensed gases at low temperatures, by William E. Williams Jr., and Emanuel Maxwell, Rev. Sci. Inst. (in press).

a light which indicates the particular part of the equipment that must be investigated.

Nitrogen Liquefaction

Liquid nitrogen (99.7 percent pure) for precooling the high-pressure hydrogen in the liquefier is produced in the liquid nitrogen plant, which consists of two complete and independent commercial units for purifying and liquefying the gas. Both units are usually operated simultaneously. Two 11,000-liter insulated storage containers, each having a loss rate of about 1.5 percent a day, make it possible to maintain a large supply of liquid nitrogen at all times.

At atmospheric pressure nitrogen must be cooled to -196C for liquefaction. In the NBS plant liquefaction is attained a few degrees above this temperature because the pressure of the gas is kept somewhat higher. During the course of the process, nitrogen is separated from ordinary air drawn in from the roof of the plant and is ultimately cooled to liquefaction by a combination of processes involving refrigeration by contact with colder gases flowing back from later stages of the cycle, expansion through a Joule-Thomson valve and through an air-expansion engine, and fractional distillation for removal of oxygen and further liquefaction.

The air from which the nitrogen is to be separated is first compressed to 3000 lb/in^2 in five stages. Between the second and third compression stages it is run through a tank containing a solution of sodium hydroxide for removal of carbon dioxide. After three more compression stages have brought the pressure to 3000 lb/in^2, the gas flows through a drier containing activated alumina for removal of moisture.

Gas Changes

With carbon dioxide and water removed, the gas now consists essentially of nitrogen and oxygen at relatively high pressure. It next enters a heat exchanger, which it leaves by two different lines. One line is connected to the cold end of the heat exchanger—about -145 C— the other is connected at a point where the temperature is about 0 C. Through this latter line the high-pressure gas enters an expansion engine. Here its pressure is lowered as it does work against reciprocating pistons. The work thus developed is absorbed by an electric generator, and this loss of energy from the gas results in a lowering of its temperature to about -140 C. Further temperature reduction down to the liquefaction point is then obtained by passage through an auxiliary low-pressure heat exchanger.

The line leaving the cold end of the main heat exchanger goes to an expansion valve, where the pressure is reduced to about 5 atmospheres. The temperature is correspondingly reduced to the liquefaction point by the Joule-Thomson cooling effect, causing a fraction of the air to liquefy.

Air Precooled

The expansion engine furnishes a sizable amount of refrigeration which indirectly serves to precool the air going to the expansion valve, thereby increasing by several times the efficiency of the process. Optimum performance of the system is obtained by regulation of the amount of air taken by the expansion engine. This is controlled by the speed of the expansion engine and the time the intake valve is open.

The two streams of partially liquefied nitrogen-oxygen mixture join and flow to a distillation column, where the liquid nitrogen is separated from the mixture. Refrigeration for condensation of the nitrogen vapor which accumulates in the top of the distillation column is obtained by piping some of the oxygen-rich liquid in the bottom of the column into a jacket surrounding the top of the column. The liquid nitrogen is continuously tapped off into a reservoir and periodically transferred to the large storage tanks.

Safety Devices

Among the many automatic safety devices in the new laboratory is a hydrogen-gas indicator which continuously samples the air at eight points throughout the plant building. Whenever the hydrogen concentration reaches 10 percent of the lower explosive limit, this device sounds an alarm and automatically closes off all sources of hydrogen. In addition, a ventilating system has been installed which normally changes the air in the building every two minutes and is automatically speeded up to effect a complete change once a minute when the hydrogen alarm sounds. Other safety precautions include conducting floors to eliminate static sparks, a system which measures the concentration of oxygen in the hydrogen with a sensitivity of 2 parts in a million, and means for venting hydrogen to the outdoors in an emergency.

Research and development at the NBS-AEC Cryogenic Engineering Laboratory are directed principally toward safer and more convenient means for handling liquid hydrogen

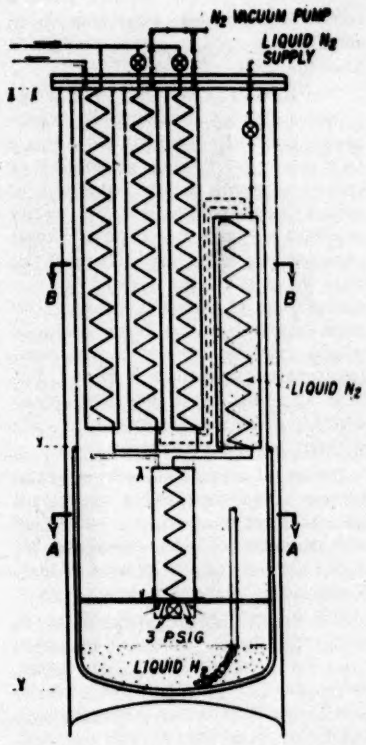


Fig. 9—Diagram of the hydrogen liquefier proper (exclusive of the compression and purification system) at the NBS-AEC Cryogenic Engineering Laboratory. The entire assembly is enclosed in a large vacuum-insulated dewar. The flow of high-pressure hydrogen gas entering the dewar at upper left is divided by the two valves between the three long heat exchangers, which are in parallel. From these heat exchangers, the gas passes through the liquid nitrogen precooler at right, through the final heat exchanger in the lower part of the dewar, and then through the Joule-Thomson expansion valve at the lower end of the final heat exchanger. The portion of the hydrogen which was cooled but not liquefied in passing through the expansion valve filters into the outer jacket of the final heat exchanger, where it acts as a refrigerant, and then passes to the long heat exchanger at the extreme left, where it cools the entering high-pressure gas. Liquid nitrogen vapor from the precooler serves as the refrigerant in the outer jackets of the other two heat exchangers.

and toward increased knowledge of the properties of materials at very low temperatures. Efficient design of low-temperature equipment requires information on the mechanical and heat-conducting properties of many metals, alloys, and plastics over a temperature range extending from room temperature down almost to absolute zero.

The Bureau is now developing apparatus for low-temperature measurement of the tensile and impact behavior and fatigue properties of these materials. Such data are at present very meager and are mainly confined to those materials and temperatures encountered in aircraft design. As a first step toward the accumulation of thermal conductivity data, apparatus has been designed which provides results in the temperature range from 2 to 300 K. The new appartus is expected to make possible more rapid collection of data without loss of accuracy.

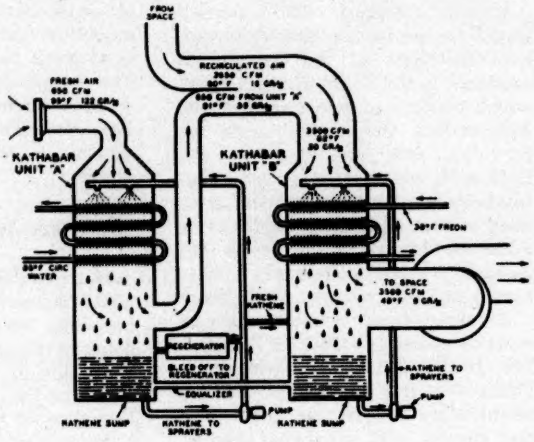
Design of a large-capacity cryostat is also under way. This equipment will be used to provide a controlled low-temperature environment for many different kinds of tests of low-temperature materials.

The Bureau is also working on the design of more efficient insulated lines for transfer of liquefied gases. A major part of this project is the development of valves, fittings, and couplings that will permit easy assembly, extension, and control of flow.

Recently the efforts of the Bureau to obtain liquid para-hydrogen on a large scale have met with signal success. Liquid hydrogen as usually produced has a high concentration of the molecular form known as ortho-hydrogen, in which the diatomic molecules have the two nuclear spins oriented in the same direction. But the low-temperature equilibrium form of hydrogen is nearly pure para-hydrogen, in which the nuclear spins in each molecule are opposed. Thus, ordinary liquid hydrogen slowly changes to the para form with an accompanying evolution of heat, and this heat causes a serious loss of liquid hydrogen by evaporation (about one percent per hour for fresh normal liquid hydrogen.)

One of the liquefiers at the Cryogenic Engineering Laboratory has been equipped with a special catalyzing chamber which results in the production of almost pure liquid para-hydrogen. This liquid hydrogen, being free of exothermic ortho-para conversion, has excellent keeping qualities and can be stored with little loss for many days.

Laboratory Removes Moisture from Air For Processing Penicillin

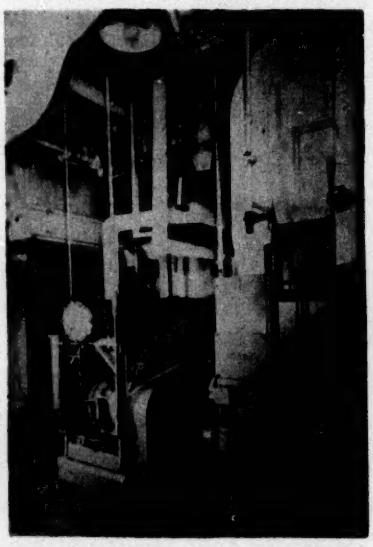


This schematic diagram of the Duplexing Arrangement of the Kathabar Units illustrates how the common regenerator is used to supply both units. All the hot Kathene Solution from the regenerator is cooled first by the circulating water in Unit A, relieving the compressor system of this load.

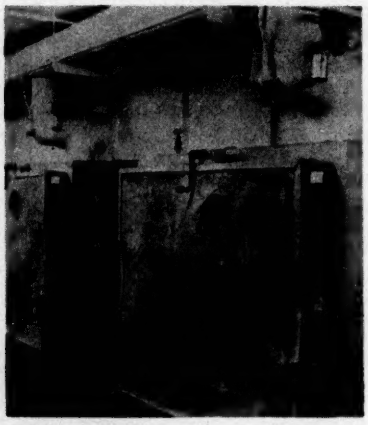
TO prevent moisture from damaging hygroscopic penicillin, American Cyanamid's Lederle Laboratories, needed air dehumidification equipment capable of delivering air at nine grains of moisture per pound in volume. Equipment, employing a lithium chloride base solution, was installed to do the job.

Removing Water From Air Flow

The problem was to remove 30 gallons of water an hour from an air flow of 3500 cfm so as to deliver the nine grain air to the penicillin processing plant which is accomplished with two Kathabar humidity control units.



The equipment used to maintain the extremely dry conditions in the penicillin processing rooms is the Kathabar "Duplexing" System. To the left is the Model 500-A Kathabar Unit, designed as Unit A in Fig. 3, and at the right is the Model 135-A Unit called Unit B. The compressor system which supplied the 38F coolant to Unit B is in the center foreground.



The walls of these penicillin processing rooms are metal lined to minimize moisture seepage. Air is supplied to this room at nine grains per pound to maintain a condition of 16 grains per pound.

Fresh air enters these units at 95F and 122 grains per pound. There it is cooled, washed and dried by the lithium chloride base solution, mixed with recirculated air and delivered after additional cooling and drying, to the distribution system at 48F and nine grains per pound.

Modern Cold Storage Plant Design

HOWARD PETERSON
Engineer Consultant
Yakima, Washington

THERE is great diversity of opinion as to what constitutes good cold storage building and equipment design.

It is the author's intention to present in this paper not a particular cold storage building or type of equipment, but rather a review of how many different ideas and designs are being used throughout the United States to meet the many varied cold storage application problems.

For the purpose of this paper, palletized operations will be considered predominately and mostly single story buildings.

The design of some plants will dictate that the floor of the buildings should be at ground level. This applies particularly to cold storage buildings located in agricultural areas handling fruit or produce. Plants in the classification of commercial storages will almost inevitably be designed with the floor at platform height.

There is one thing which is paramount in the selection of the site for the proposed building. There must be ample area for the operation. The truck loading and unloading area should have 60 ft. of unrestricted clearance at the front of the building for the large tractor-trailer combinations. Probably, there will be trackage on the back side of the building. A palletized plant with sufficient property surrounding it gives rapid movement of the commodity in or out by truck or rail, and economical handling of the commodity within the building.

Cooler Structures

Let us assume we have decided to build a high temperature cold storage building designed for the use of lift trucks for the storage of apples. This demands clear floor area with roof trusses from wall to wall. There will be 20 ft. minimum clearance from underside of truss to the floor. The floor will be approximately two inches above ground level, or sufficient to be sure that flash storms cannot flood through the door openings. Site grading of one and one half inches in 20 ft will give a slight slope to the black top apron extending from the building.

AN N.A.P.R.E. CONVENTION PAPER.

Above ground our cold storage building is a structural problem. Whether the walls are to be reinforced concrete, concrete pilasters and tie beams with concrete block filler in between, masonry, or mill type construction must be determined by the expected life of the building, construction cost and the alloted appropriation. Wood or steel trusses, and laminated wood or steel I-beams, are possibilities for spanning the space from wall to wall.

New Insulations

A strong trend toward buildings without ceilings seems to be in effect in single story palletized plants. There are obvious advantages. The building is less costly to build without a ceiling. The roof deck can serve both as a support for the insulation and the roofing. Either fill or rigid board insulation can be used for the roof. Rigid board can be laid in hot adhesive in the same manner as on the floor. It lays rapidly and labor cost is at its lowest. Fill insulation can also be placed at its lowest labor cost. The room cooling unit and ducts can also be placed in the truss space at little extra cost. The entire floor area is then available for productive revenue space.

There have been no recent or particularly unusual developments in new insulations which have materially reduced the cost of insulating cold storage buildings. The possibilities of aluminum foil are becoming increas-subject of how much insulation in the ingly interesting. The writer feels that the increased emphasis on vapor barriers is one of the most important steps made in 25 years to improve the effectiveness of room insulations.

This also brings up the controversial floor can we get along *without*. We could discuss for considerable time, minimum insulations for high and low temperature buildings. By minimum insulation is meant that point where it is better economics to reduce initial investment in the building by using less insulation, knowing that power cost will be somewhat increased. In view of the present tax structure on corporations, many have chosen to accept the slightly higher power bill which can be written off as an operating expense.

Design Trends

In our general discussion let us consider both high and low temperature cold storage plants. By high temperature, I mean 30F and above for the storage of fresh fruit and produce. Rather than analyze all the details of some specific building let us take a look at current design in both temperature fields in plants throughout the U. S. Fig. 1 shows a typical apple storage building with the floor at ground level (Strand Fruit and Storage Co., Cowiche, Washington), and is of reinforced concrete tilt-up design. Note that the lift truck can roll out onto the black top apron surrounding the building, pick up the fruit which has already been loaded on pallets on the bed of the truck, and deliver it immediately into the building where the fruit is stacked. Fig. 2 is inside the Strand Fruit building showing the air ducts in the truss space.

One room of the W. E. Roche Fruit Company building in Yakima, Washington is pictured in Fig. 3. This room, 170x60x22 ft high is for pear precooling and apple storage. Two cooling units located over the compressor room deliver 60,000 cfm of air into the tapered duct on the under side of the ceiling. The ducts are tapered, based on the static regain principle. Note the round discharge nozzles on the side of the ducts. By the design of these nozzles, and the velocity of the air discharged from the nozzles, a very desirable aspiration effect is accomplished.

It has been shown that the air discharged from the nozzle will pick up as much as twice its' own value due to its' velocity energy at the point of discharge. This has several desirable effects. In the first place, the low temperature air from one cooling unit is tempered by its' mixture with the recirculated room air. Fruit or produce will not be frozen even when stacked adjacent to the discharge nozzles. The nozzles on a tapered duct, with slightly more than normal pressure, delivers the air uniformly along the length of the room irrespective of whether the room is filled or nearly empty. In other words, a block of warm fruit will get its proportion of refrigeration whether there is any other space occupied or not.

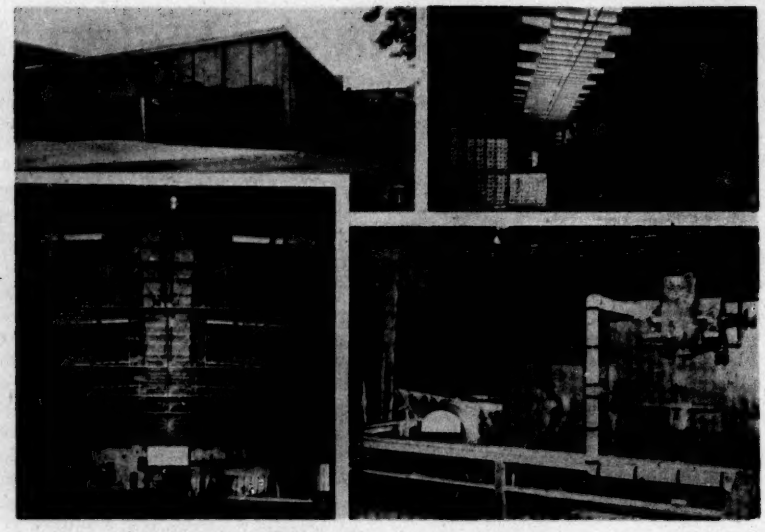


Fig. 1—A modern apple storage of tilt-up reinforced concrete design at Cowiche, Washington.

Fig. 2—Interior of Cowiche apple storage, showing refrigerated air distribution ducts carried in truss space.

Fig. 3—Interior view of an apple storage and pear pre-cooler storage warehouse, Yakima, Washington. Specially designed ducts function as aspirators effecting three times the cooling obtained by conventional ducts.

Fig. 4—One of two 33 ton Vilter water defrost air cooling units in the Cashmere, Washington fruit growers union's apple storage.

Aisle Return Duct

There is no return air duct. The air is delivered uniformly where it is desired in the room, in metered amounts, and discharged at substantial velocity. Each nozzle takes care of its' alloted area. The aisle in the middle of the room is the return air duct. The fruit at the far end of the room will get just as much refrigeration as the fruit adjacent to the cooling unit.

Another important factor of this system is that approximately 150,000 to 180,000 cfm, not 60,000 cfm, is actually moving over the fruit. It is positively known that heat transfer is more rapidly effected by an appreciable air flow than by a relatively sluggish air movement. The greater air movement sweeps out the "hot spots" in the box pile. At the end of the receiving season when all fruit has been precooled the air volume is reduced to half to save power cost for the remainder of the storage season. The refrigerating equipment in this plant is fully automatic even to the water defrosting of the finned coil cooling unit.

Another of the Pacific Northwest's recent modern apple storage plants was constructed by the Fruit Growers Union, Cashmere, Washington. The four cold storage rooms are each 120x120x21 ft to the under side of the truss. The walls and roof are insulated with four inches of corkboard. The cork on the roof is laid on the roof deck and covered by a built up roof. The floor insulation is composed of 9 inches of pumice concrete laid on the ground and covered by five inch concrete wearing floor. A series of thermocouples placed in the floor and in the earth beneath the pumice concrete indicates a temperature difference of approximately 30F. The concrete floor of the building is located at ground level with only sufficient difference in elevation to assure a slope away from the building.

Refrigeration

Refrigeration is furnished by two Vilter water defrost cooling units in each room mounted in the truss space above the fruits (Fig. 4). Each unit has a rated capacity of 33 tons of refrigeration with a 15 degree TD, and delivers 33,000 cfm of air through ducts located in the truss area. Each room has a defrost timer set to defrost all unit coolers in rotation six times every 24 hours. The air units are served by five 6-cylinder Vilter VMC compressors, two of which are driven by 50 hp and three by 75 hp motors. At design pressures of 25 lbs discharge, the refrigeration load is 214 tons. The three 75 hp compressors are controlled manually according to load requirements and do not have capacity unloaders. The two 50 hp compressors are equipped with capacity unloaders and operate automatically by means of pressure switches to handle fluctuations in the load. After the receiving period, the two smaller compressors will handle the entire load under automatic control for the balance of the storage season.

Fig. 5 shows the reinforced concrete building of the B H & O Cold Storage Company, Orange Cove, California. In this building 18 inches of dry sand fill was placed directly under the floor. Dry pumice fill extends 8 ft from the outside foundation walls under the floors to effect a heat barrier against outside temperatures. The balance of the floor has no conventional insulation.

First Unit

The first unit of this building, built in 1948, is a structure 212x94x15 ft high in the clear having four grape storage rooms and one grape precooling room. I-beams 24 inches deep are spaced 19 ft on centers to span the 53 ft wide rooms, replacing conventional trusses. The I-beams are supported by 8 inch wide flange H-columns. All structural steel of the building is located within the insulated envelope. Purlins 4x10 and a two inch roof deck complete the ceiling-roof structure. Six inches of Firtex rigid board insulation was placed on the roof deck, which in turn was covered with an asbestos built up roofing. Four inches of corkboard was used on the walls. The rooms are designed for 30F. The refrigeration in this section of the building is from bunker coils which are prime surface flooded ammonia type with surge drum and float control. Three 5 hp axial vane fans pull the air upward thru the bunker coils and discharge it into ducts which uniformly distribute the air in each room. Approximately 1000 cfm per ton of refrigeration is required. The coils are defrosted by hot gas. In the holding rooms defrosting is done at intervals of about once in six weeks. The plant is designed for fully automatic operation, but due to the nature of the commodity processed and stored the management considers it wise to employ three shift operators.

In 1951, a new addition 120x63x20 ft high in the clear, was erected of similar design to the original building. The refrigeration is supplied by prime surface bunker coils (Fig. 6). In this room an ammonia liquid pump recirculates the refrigerant from the low pressure receiver to the coils in the bunker. Four 5 hp axial vane fans were used in this room.

Now let's take a look into develop-

ments in the low temperature cold storage field. Fig. 7 shows the outside of the new low temperature cold storage building for National Ice & Cold Storage Company, Riverside, California. The roof outline shows the contour of two large rooms 100x65x 13 ft from under side of truss to the floor. Entry into the rooms is made thru an inside vestibule the length of the two freezer rooms and approximately 20 ft wide. The vestibule is not refrigerated.

Insulation

Insulation used in this building is 16 inches Palco Wool, fill type insulation (Fig. 8) in walls and roof. The floor insulation is 6 inch corkboard. In this building the wooden trusses extend from wall to wall. The structural members, such as the wooden columns and stabilizing frame work are in the inner wall. The main building structure is really the inner wood framework. The outside walls and top roof deck are actually only a form to hold the insulation.

Sub-flooring is six inch concrete with 6x6x10x10 reinforcing mesh laid over 2 inch pipe spaced 10 ft on centers. Oil is circulated continuously through the pipes to preclude any chance of frost heaving the floor. A three hp pump circulates the oil through a continuous coil under each room. The heat source is a discharge gas oil heater. The range of temperature is approximately 54F. High pressure liquid ammonia has also been used as a heat source.

In the Central Florida Refrigeration Warehouse, Plymouth, Florida, a 2,000,000 ft building held at minus 10F for the storage of frozen orange juice concentrate, the floor is layed on an elevated four ft sand fill with no insulation under the floor. The eight inch corkboard wall insulation extends down five ft below the concrete floor.

The low temperature installation of the Lamb-Weston Company, Weston, Oregon, has no insulation under the floor. In fact, it has no floor—in the conventional sense. The four inch corkboard insulation on the walls extends down to the foundation footings approximately four ft below the surface of the fine crushed rock which constitutes the top of the fill. The fill consists of approximately three ft of compacted dirt, covered with eight inches of river gravel, which in turn was covered with approximately two inches of fine crushed rock. The fine crushed rock was thoroughly worked into the gravel and heavily rolled for a smooth and level grade.

Under the dirt fill was placed four inch tile running the narrow way of the room on three ft centers. They are vented to the outside. It is reasoned that the moisture, which would cause frost and subsequent heaving, will come right through. There will be in fact, actual dehydration of the soil below. The commodity is stacked on a sectional wooden framework similar to a very large pallet with the top slats approximately six inches above the crushed rock to allow for air circulation under the cartons. Transportation of the commodity is by belt conveyor.

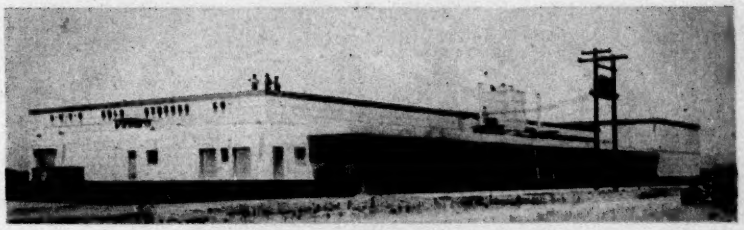


Fig. 5—A flat roof decked fruit cooling and storage building for B H & O Cold Storage Company, Orange Cove, California.

Sprayed Waste Condenser Water

Another feature in this building, and one which the writer has long felt had very desirable economic possibilities, is the use of sprayed waste condenser water over the roof of the cold storage room. With the dry bulb temperature depressed approximately 20 due to evaporative cooling it is estimated approximately four tons of refrigeration is saved in roof heat losses. The cold storage room is 200x125x20 ft to the under side of truss.

The Merchants Refrigerating Company have recently completed their plant at Hopkins, Minnesota. Fig. 9 shows the outside front of the building with the main office and an enclosed truck loading platform. Fig. 10 shows the floor plan giving over all dimensions of the building. It is a one story reinforced concrete building with an average ceiling height of 16½ ft. A 20 ft wide open loading dock is on one side of the building for railroad cars. On the other side of the building is a 20 ft wide enclosed platform for truck service, including a completely enclosed truck house for trailers.

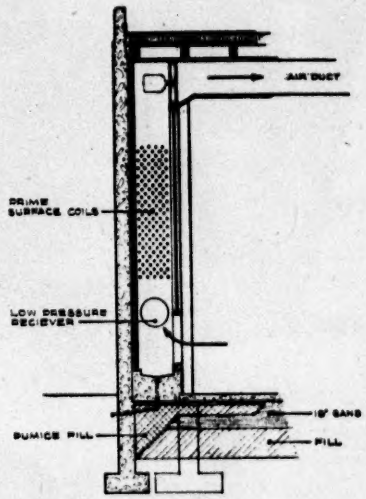


Fig. 6—Arrangement of refrigeration machinery bunks at the B H & O warehouse. Liquid ammonia recirculation is employed.

Interior Features

Fig. 11 shows the inside building construction consisting of concrete floor, steel columns, steel girders, and steel roof beams carrying the roof which is made up of three-inch precast concrete slabs upon which is placed 8 inch corkboard insulation

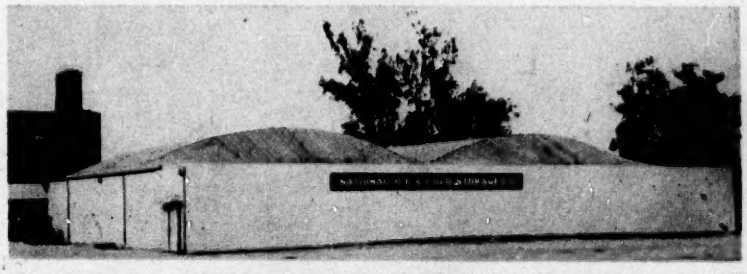
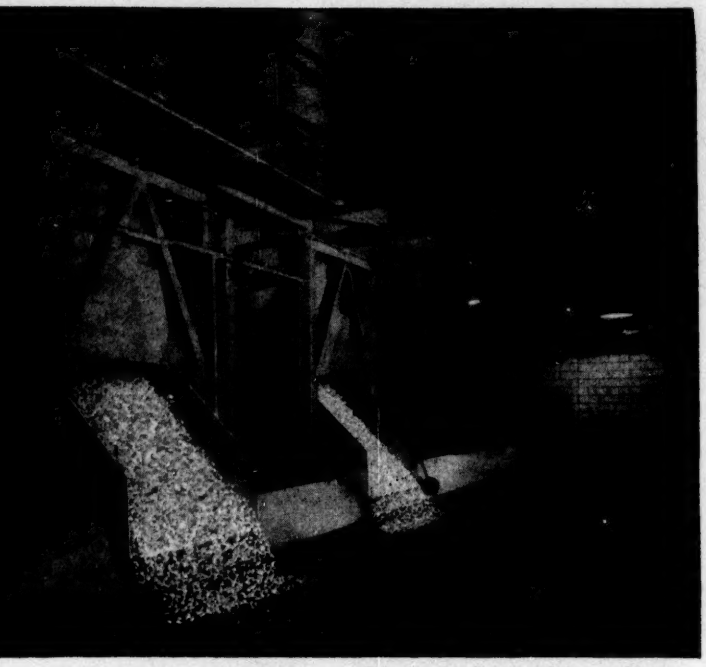


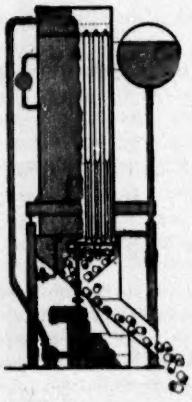
Fig. 7—One story low temperature warehouse for National Ice & Cold Storage Company, Riverside, California, consisting of two large storage rooms and an ante room arranged longitudinally.

120 TON
connected refrigeration capacity provides equivalent of
300 TONS
COLD WATER
refrigeration for Wort Cooling
with the...



Tube-Ice Machines and Latent Heat Water Tank at Burkhardt Brewing Co., Akron, Ohio.

Vogt *Automatic* TUBE-ICE MACHINE



HOW THE TUBE-ICE MACHINE FUNCTIONS

In making ice, water is pumped to the top of the freezer and flows downward along the inside walls of tubes into a water tank. Refrigerant in shell surrounds tubes and freezes water into cylinders of ice. An automatic timing mechanism operates suitable valves to control all functions of the machine. Ice is freed from the tubes by thawing when the refrigerant is displaced by high pressure warm gas from the compressor.

To cool water only the evaporating pressure is raised above that required for making ice.

Employing direct application of the refrigerant, all expense incidental to other systems is eliminated.

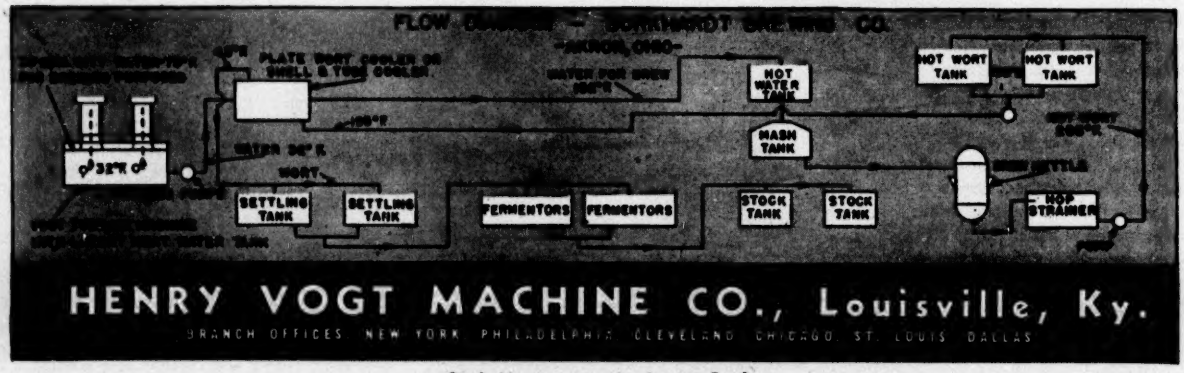
Patent Numbers 2,200,424, 2,239,234, 2,396,308. Other Patents Pend.

The Burkhardt Brewing Co., Akron, Ohio, saves more than 50% of their cold water refrigeration cost with a modern Vogt Water Cooling System!

Here, two Vogt Automatic Tube-Ice Machines make cold water during the day and Vogtice at night, thus utilizing refrigerating capacity around-the-clock. The stored ice acts as a flywheel by cooling make-up water to augment the supply made by the machine to meet the peak wort cooling loads. The refrigeration load demand is thereby leveled out with a resulting reduction in demand charges on electrical energy, and the use factor of installed equipment approaches 100%.

Additional economy is realized from this system since the water, after cooling the wort, goes into the next batch of beer. Thus no heat potential is wasted but all is used to do useful work.

A flow diagram of the Burkhardt Brewery is shown below.



HENRY VOGT MACHINE CO., Louisville, Ky.

BRANCH OFFICES NEW YORK PHILADELPHIA CLEVELAND CHICAGO ST. LOUIS DALLAS

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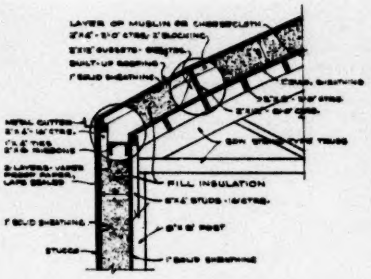


Fig. 8—Details of the building construction and insulation placement at the National Ice and Cold Storage Company, Riverside plant.

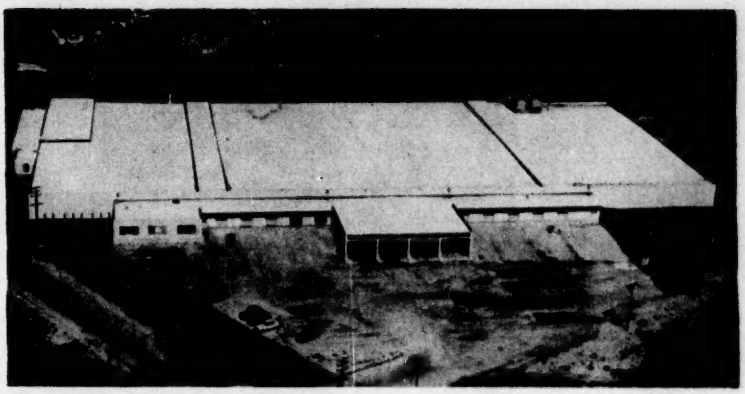


Fig. 9—Aerial view of Merchants Refrigerating Company, freezer plant at Hopkins, Minnesota, showing ease of access by truck and rail.

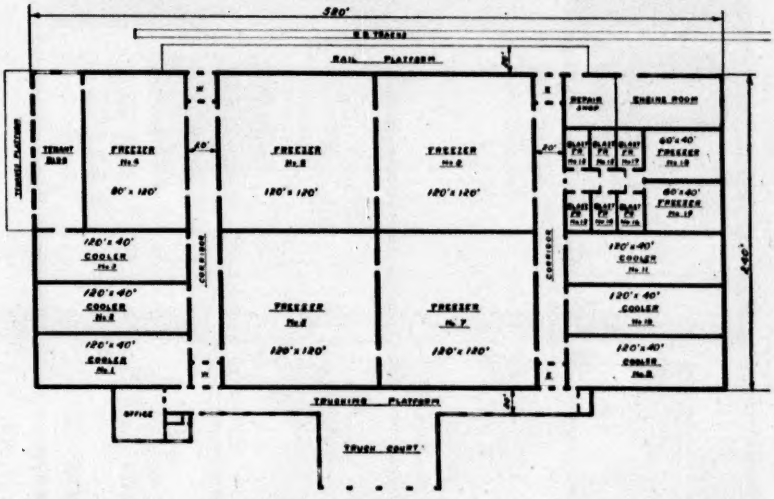


Fig. 10—Floor plan of Merchants Refrigerating Company warehouse. Rooms are arranged to open into the corridors, minimizing frost accumulation.

and conventional roof covering. The floor construction consists of a six inch concrete sub-floor placed directly on the ground fill, with steel reinforcement. Six inch corkboard insulation is placed on the sub-floor. A four inch reinforced concrete wearing floor is poured on top of the corkboard. The floor load is designed for 600 lbs per sq. ft. The partition walls consist of eight inch speed tile. These walls are supported on the sub-floor and act just as curtain walls. Wall insulation consists of six inch corkboard applied in Enamelite which serves also as a vapor seal. Floor, wall and roof insulation join at all points to form a complete insulation envelope. The warehouse floors and loading docks are at platform height. The building is designed for palletized operation with fork lift trucks.

Refrigeration System

The refrigeration system is a combination of brine circulation and direct expansion ammonia. The brine circulation is used in all the storage rooms and the direct expansion ammonia in the blast freezers. The storage rooms are maintained at minus 10 F and the blast freezers are at minus 40 F. The heat exchange surface in the storage rooms consists of approximately 28,000 lineal ft. of 1½" fin pipe coil manufactured by the Detroit Ice Machine Company. This represents about 130,000 sq. ft. of evaporative surface. The blast units are also fin coil surface.

The two main corridors which are 20 ft wide are air locked at each end. They are refrigerated by fin pipe coils and maintained at plus 25 F. It tends to minimize the need for defrosting the storage rooms coils.

The ammonia compression system is two stage. Water and ammonia intercoolers are provided between the stages. Capacity of the system is approximately 300 tons. Minus 30 F. evaporator temperature is maintained for brine cooling. The plant is designed for semi-automatic control to the extent that an operator is on duty only during the day shift. During the other sixteen hours the plant is completely automatic. The various safety devices such as high pressure cutouts, oil pressure switches on the compressors, high liquid ammonia level in various surge drums or brine coolers, brine level floats, etc. are all connected to an ADT alarm system. All these safety devices are arranged to shut down the plant either partially or completely and at the same time give a signal to the ADT, who in turn call the proper person to check the plant.

In order to prevent freezing of the ground and frost heaving of the floors, eight inch diameter tiles were placed on six ft centers across the building. These pipes were placed immediately below the floor and provide heat supply to the floor during the warm and temperate seasons of the year. There is also the possibility of supplying artificial heat to the floor during the winter, if conditions should require it. A number of thermocouples were placed in the ground at various points which are connected to a potentiometer in the compressor room by means of which it is possible to keep a close check on temperature conditions under the floor. The plant has been operating close to a year and so far there has been no necessity of supplying extra heat through these pipes.

Fig. 12 is a photograph taken of a room on the top floor of the Terminal Cold Storage and Ice Company, Dayton, Ohio, 90x70x11 ft high. You will note the small amount of space required for a very substantial amount of evaporator surface. There are just two runs of Detroit Ice Machine Company's finned pipe around the outside walls and eight runs down the center of the room over the aisle. These are flooded ammonia coils with surge drum and float control.

THERMO EXPANSION VALVES

TYPE 402
with pressure limiting feature

TYPE TK
"3 valves in 1"

TYPE TCL

TYPE TR
Multi-Outlet

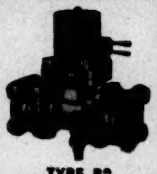
For automatic control of liquid refrigerant on all types of refrigeration and air conditioning systems. Capacities: from fractional tonnage to 50 tons "Freon-12", 100 tons Methyl Chloride. Low temperature valves for −40° F. to −100° F.

SOLENOID VALVES

TYPE S1

TYPE S2

TYPE M3



TYPE R2

For all types of service. For liquid: "Freon"—up to 75 tons. Methyl Chloride—up to 150 tons. For suction: "Freon"—up to 8.8 tons. Methyl Chloride—up to 17 tons. For brine, water, gas, air and steam.

FLOAT VALVES AND SWITCHES

TYPE HK
high pressure float valve

Up to 5 tons "Freon-12", 10 tons Methyl Chloride and 20 tons Ammonia.

TYPE J5
electric float switch

For "Freon", Methyl Chloride, Ammonia and other non-corrosive liquids having a specific gravity of .6 or more. Up to 460 volts AC and 250 volts DC.

908 LECTRO-LEVEL electronic remote control of liquid level

Accurate control for full-flooded evaporators. Adjustable to a wide range of level changes. Easy-to-set control dials conveniently mounted in remote box. Successfully used for over 5 years.

ALCO VALVES

the COMPLETE LINE of refrigerant controls

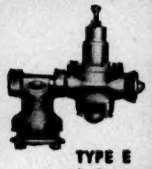
AMMONIA CONTROLS

TYPE M91F

TYPE TG

TYPE UG

TYPE TX



TYPE E
with Strainer

SUCTION LINE CONTROLS

TYPE EPR

For all refrigerants, with connection sizes up to 6"

TYPES 771-772
SUCTION PRESSURE REGULATORS (HOLD-BACK VALVES)

Prevent motor overload. Freon-12, Freon-22.

TYPE 760
"EVAPOTROL"

Pressure regulator—½ ton, "Freon-12"—⅜ ton, Methyl Chloride.

Solenoid Liquid Valves — up to 172 tons. Solenoid Suction Valves — up to 28 tons. Thermo Expansion Valves—from fractional tonnage to 125 tons. Automatic Expansion Valves — from fractional tonnage to 60 tons.

For capacities in excess of those listed, write us for further details and give specific requirements.

ALCO ALSO MAKES: Constant Pressure Expansion Valves — Liquid and Suction Line Strainers.

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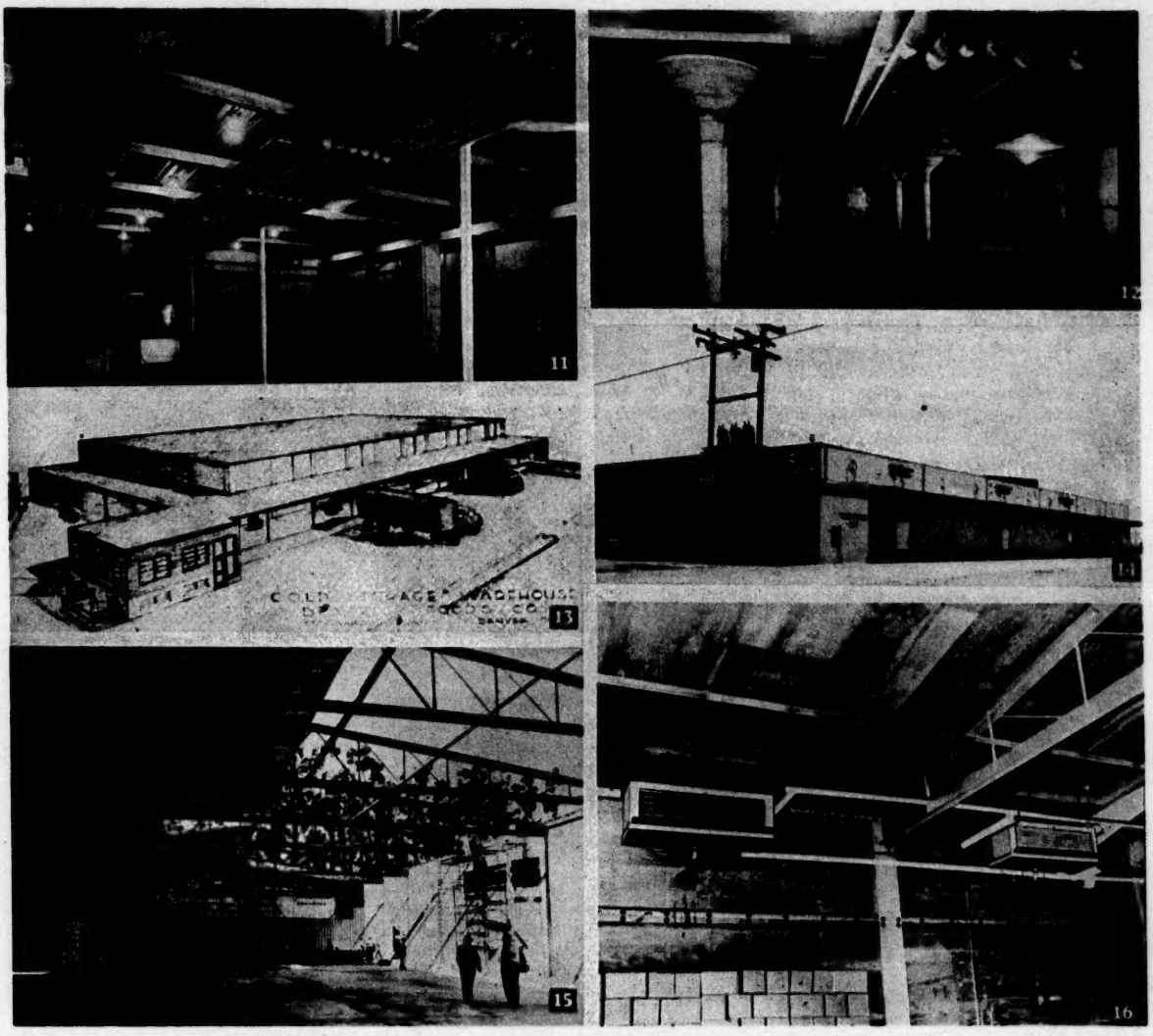

Fig. 11—An interior view of a low temperature room at Merchants. Note steel roof panels supported by steel columns and girders. Precast concrete slabs are placed in the panels.

Fig. 12—Converted cooler rooms at Terminal Cold Storage and Ice Company, Dayton, Ohio, showing utilization of Dimco cast aluminum fin evaporative sections.

Fig. 13—Beatrice Foods, Denver plant, entire freezer installation.

Fig. 14—Union Ice Company, Oxnard, California, pre-fab low temperature warehouse. Corkcrete floors and insulated panel construction featured.

Fig. 15—A view of the Union Ice Company Oxnard job during erection. Insulated roof panels are laid on purlins and steel trusses.

Fig. 16—Union Ice Company job after completion, showing insulation panels in place and ceiling hung units.

Four years ago part of the dry storage in the Great Lakes Terminal Warehouse & Cold Storage Company, Toledo, Ohio was converted to sharp freezer and freezer storage space. The sharp freezers range from minus 20 to minus 30 F and the freezer storage rooms are minus 5 F. Finned coils with direct expansion ammonia were installed in all the converted area (Fig. 12). The original building, constructed in 1927, is cooled with minus 17 brine. Two stage compressors were connected to the brine coolers.

In 1927, the ratio of cooler (30 F. or higher) and freezer storage space was far different from what is considered good practice today. This plant was originally built with the available space divided evenly between freezers and coolers. Due to changes which have been made since that time, it is now 70 per cent freezers and balance coolers. Most recent practice in East and Midwest is to plan the available space for about 90 per cent freezers and 10 per cent coolers.

The Beatrice Foods Company (Fig. 13) in their new low temperature plant located in the Denver area are building a reinforced concrete building at platform height, of tilt up construction. Tilt-up design has become increasingly popular as a more rapid and less costly type of reinforced concrete building for single story industrial buildings. It is well adapted to cold storage building application. The roof construction consists of prestressed concrete girders and slabs, with insulation and built up roofing placed on top. The storage area in the Beatrice plant consists of approximately 26,000 sq ft, all of which will

carry freezer temperatures between minus 10 and minus 40 F. The total area is divided by one wall. Two thirds of the building are refrigerated with blower units, and balance will have approximately 14,000 ft of two inch pipe with still air. It was decided, because of numerous requests by customers, to refrigerate this portion of the building with coils only.

Vented Sub-floor

While Denver is in a high area of relatively low humidity, consideration has been given to the possibility of excessive moisture building up frost under the floor. Hollow tile has been installed below the floor under the gravel fill. This plant is so designed that no break occurs between the insulation of the floor, walls, and roof. The roof, floor and walls have six inches of corkboard insulation, and a freezer tunnel, designed to take a charge of approximately 100,000 pounds of perishable products every sixteen hours, will have eight inch insulation on its walls, ceiling and floor. The columns passing through the interior of the freezer floor will be insulated above the wearing floor to prevent freezing of the footings.

Good engineering, in the writer's opinion, is effort used toward lower costs while maintaining the quality. We want first quality buildings at less cost. We also want a first quality product at less cost. The writer has already mentioned tilt-up reinforced concrete buildings as a method of lowering building costs. We have been considering various approaches to good equipment design to lower operating costs. Much effort has been put toward cost reduction in building low temperature buildings. Fig. 14 is the Oxnard, California plant of Union Ice Company. The building is 240x90x22 ft in the clear. The subfloor is 12 inch corkcrete poured at ground level with a five inch wearing floor over. The wall panel was assembled on the floor with 10 inch fiberglas placed between studs. Ceiling-roof sections were insulated with 12 inch fiberglas. A motor crane was used to set up the wall panels and roof sections. Fig. 15 shows all insulated wall panels erected, the steel trusses in position and a portion of the insulated roof panels in place. The outside walls are ready to be covered with metal lath and cement plaster. Fig. 16 shows application of three ton water defrost Recold ceiling mounted cooling units. Six of these units are located in the large room and three similar units in each of the two small rooms. The units utilize flooded ammonia with a central surge drum and float control in each room. The compressing equipment consists of an 8-cylinder Vilter VMC booster and the 6-cylinder VMC second stage compressor. A gas and liquid intercooler is located between the compressors. Under the floor two inch pipes on 12 inch centers have water circulating through them from the oversize evaporative condensor pump. Rooms are maintained at minus 10 F.

This writer might be called a "pipe coil man" for low temperature operation. That is not entirely correct. The author has seen many misapplications of air units. There is a definite place for both pipe coils and air units. To prove that point let's discuss two recent installations:

Pipe Coil Evaps

The first is the new Merchants Terminal Warehouse Corp. plant in Baltimore. This is a two million cu. ft. plant, all minus 10 F. divided into two large rooms. York High-fin coils were selected for the ceilings of these rooms arranged one pipe high and 8 pipes wide over the aisle spaces. There are no pipe coils over the product storage area. The little defrosting done is by hot gas, loosening the ice from the coils and permitting it to fall on tarps rolled out in the aisle. The ice is then rolled up in the canvas and carried out.

To be sure minimum defrosting is required, air units are installed above the vestibule entrance into each room. These vestibules are, of course, air locked on each end with batten doors. The cold air is simply discharged downward into the vestibule and returned up to the air unit. The sole purpose of the air units is to take moisture out of the air. In one of the large cold rooms a freezing tunnel is installed. These are banks of spiral finned coils with air blasts through them. The small break up rooms along the platform have small air units in them.

The use of High-fin coils in the large rooms represents a tremendous saving in fan motor power cost. Air units were used where it was desirable to dehydrate the air or provide fast chilling or freezing. This, to the writer represents the proper use of both pipe coils and air units. Even though none of the above is particularly new, there was one aspect of this job which I do not believe has been used before. Freon-12 is being used in the liquid recirculation system instead of ammonia. The engine room equipment consists of York rotary and V/W compressors, liquid pumps, etc. all of course handling Freon-12.

Floor Air Units

The second job is the new Midsouth Refrigerated Warehouse Co., Memphis, Tennessee. The equipment on this job consists of Niagara floor type industrial air units in the rooms with four York rotary and four V/W compressors in the engine room, handling ammonia in a liquid recirculation system rated at 300 tons. The new idea here, with the correct application of air units, is that these rooms are to serve the dual purpose of freezing and storage room. It is felt that the somewhat higher initial investment will be more than offset by lower handling costs later. There is sufficient air capacity in each room to permit it to function as a freezing tunnel. After the products are frozen they will remain in that position in storage until they are removed from the warehouse.

The Midsouth building is 350x250 x16 ft, six inches under the trusses. There are five freezers 200x50 ft at minus 20 F. These rooms each can be divided into four quick freezing areas at minus 30 F. There are in addition, four 50x50 ft freezer rooms. Enclosed docks surround the outside of the freezing rooms. Each of the large rooms has a vestibule. There is eight inches of Fibreglas insulation on the walls and floors, and 10 inches on the roof. The inside surface of the wall insulation is covered with perforated masonite. The building is of tilt up construction with concrete prefab roof. Steel columns, girders, and joists are used. Thermocouples are located under the floor. An ADT system protects the refrigeration equipment.

The following figures from the USDA were quoted in the August 19, 1952 issue of Cold Facts: Cold Storage Space, December 31, 1951: Cooler (above 29 F), 205 million cu ft; Freezer (0 to 29 F), 51 million cu ft; and Sharp Freezer (0 & below), 169 million cu ft. Totals are 425 million cu ft of refrigerated storage space at the end of 1951. This is a decrease of 17 million cu ft in freezer space, as against an increase of 35 million cu ft in sharp freezer space.

In the October 1952 issue of Cold Facts appeared the following list of "What Bothers Refrigerated Warehousemen most." 1) increased costs of operation—especially constantly increasing wage rates. 2) labor problems—difficulty of finding good workers, high turnover, union demands, 3) government controls and interference in business; 4) price controls; 5) taxes; 6) increased office detail—especially requests for special serv-

(Continued on page 60)

STYROFOAM INSULATION OFFERS CONSTRUCTION ECONOMIES

For example, self-supporting partitions of this high structural strength, rigid-type insulation are easily and inexpensively installed

1. Self-supporting Styrofoam partitions require that at least two layers of Styrofoam be used, supported directly on the sub-floor (before the floor insulation is laid). The first layer of Styrofoam boards is snugly tied to a temporary 2 x 4 studding framework.

2. The second layer of Styrofoam boards is adhered to the first by means of a ¼" coat of Portland cement mortar and wooden skewers.

3. After the mortar is set (at least 3 days) the exposed surface is finished with two ¼" coats of Portland cement plaster. When this plastered surface has set, the temporary framework is removed and the other side of the wall plastered.

The Dow Chemical Company
Plastics Department, PL 1491C, Midland, Michigan

Please send me your booklet containing information on Styrofoam, the most nearly perfect low-temperature insulation material.

Name_____

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Styrofoam®, a lightweight plastic foam made by expanding Dow polystyrene approximately 10 times, is a big problem solver and money saver in the building of self-supporting partitions. No money or labor is required for other supports because Styrofoam is strong enough to stand alone.

Styrofoam has proved in laboratory and field tests to be the most nearly perfect low-temperature rigid-type insulation material yet developed. Its composition of non-interconnecting cells provides exceptionally high resistance to water and water vapor. Other major advantages of lightweight, odorless Styrofoam include its ease of fabrication, long service life and resistance to rot and mold.

For more detailed specifications and applications of Styrofoam, write for the free Styrofoam data booklet. THE DOW CHEMICAL COMPANY, Plastics Department, Midland, Michigan.

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● FOAMGLAS stays dry

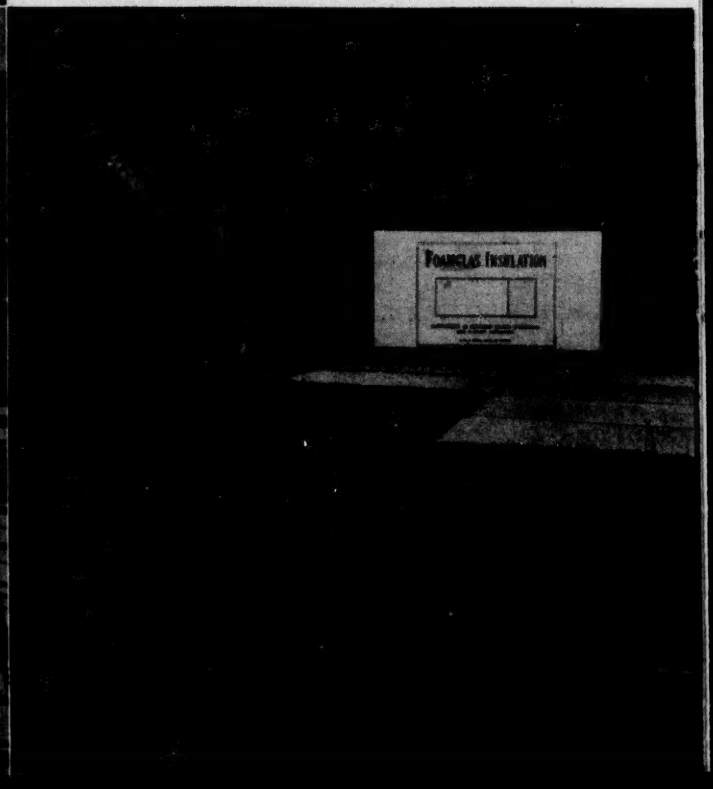
The sealed glass cells of FOAMGLAS are inherently waterproof . . . effectively resisting moisture absorption and the transmission of water vapor.

● FOAMGLAS can't burn

The fact that this cellular glass insulation is completely non-combustible is an important safety factor for all types of construction.

● Rot and vermin proof

FOAMGLAS is inorganic . . . will not rot or deteriorate and provides no food or nesting materials for rats, roaches or other pests.



● Long-lasting insulation

Lightweight, but strong and rigid, FOAMGLAS *retains* its original insulation value . . . gives long, maintenance-free service on floors, walls, ceilings, roofs, piping and equipment in refrigerated structures.

BRAND-NEW BOOKLETS!

Write us for these new booklets which are packed with the latest information about FOAMGLAS, indicating whether you are interested in insulation for refrigerated structures, piping, or equipment. Address Dept. T-113 . . .

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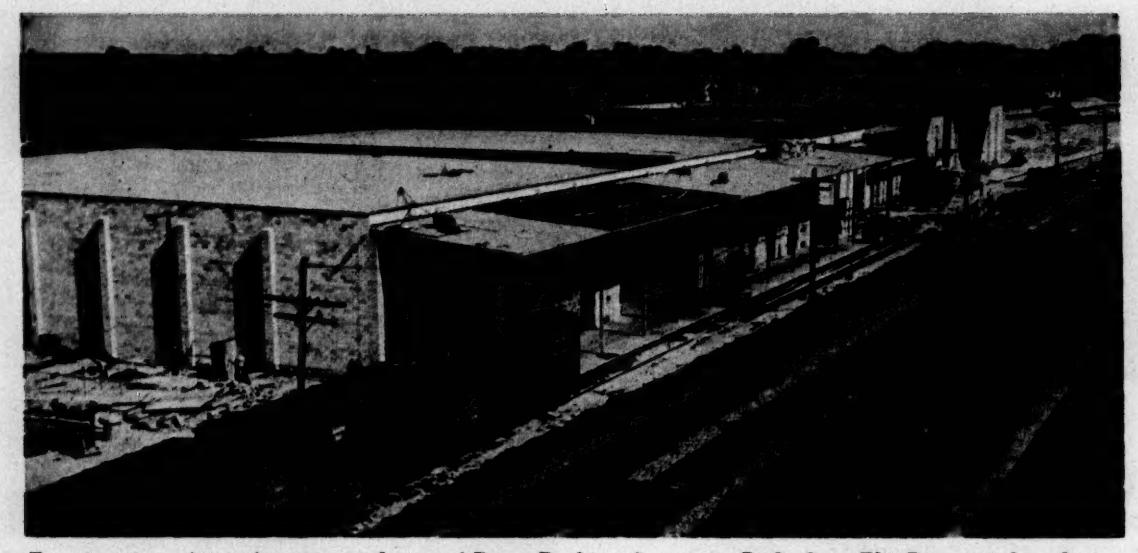


Exterior view of new freezer warehouse of Pasco Packing Company, Dade City, Fla. Picture taken during construction.

Citrus Packer Completes Freezer Warehouse

A. T. LOHKAMP
Supt. Steam & Refrigerating Plant
Pasco Packing Company
Dade City, Florida

A NEW freezer warehouse, one of the really large operations, has been completed by the Pasco Packing Company at Dade City, Fla. The largest structure of its type in Florida, the new warehouse includes 2½ million cubic feet of space and has a capacity of 2½ million base cases (5,625,000 gallons) or 833 refrigerator car loads of frozen concentrate. This warehouse will hold about half of the company's production of this commodity, packaged and ready for shipment.

Citrus Products

Pasco locally owned and operated, processes and packages about 18 per cent of all citrus processed in Florida. In addition to canning citrus juices, concentrates and fruit sections, the company, founded in June of 1936, processes the citrus peel for cattle feed and extracts essential oils, vitamins and other by-products of the citrus fruits.

More than 90 railway carloads, or nearly 2½ million board feet of Fiberglas low temperature and roof insulation manufactured by Owens-Corning Fiberglas Corp. were installed in the warehouse, which will be literally "wrapped in glass". Insulation thicknesses are nine inches in roof areas, eight inches in walls and eight inches in the floor. The warehouse in constructed to maintain temperatures at 15 degrees below zero.

Frick ammonia compressors and allied equipment are used for refrigeration. The evaporators in each of the four freezer rooms are Niagara No-Frost units manufactured by the Niagara Blower Company. The design of the refrigeration system makes possible a completely automatic operation with periodic checks to see that the lubrication systems of the refrigeration compressors contain ample oil.

Temperature Control

A Minneapolis-Honeywell temperature controller is used to step up or step down the amount of desired compressor capacity. The temperature element of this controller is inserted in a well provided in the Ammonia Suction line. This well is kept filled with liquid ammonia by means of a small Sporlan level master. The temperature of this small amount of liquid ammonia always corresponds to suction pressure so that a set temperature of -30 F with a plus or minus of 2 F will maintain the suction pressure between 0 psig and 3.2 inches of vacuum. The temperature controller will, through a Cutler-Hammer control panel, increase or decrease the number of compressors in operation as the need may be.

Selection of the Frick compressors was based upon total refrigeration capacity needed at worst possible conditions and to allow capacity increases in steps of from 15 to 35 tons each. There are eight possible combinations of tonnages through the Cutler-Hammer controller.

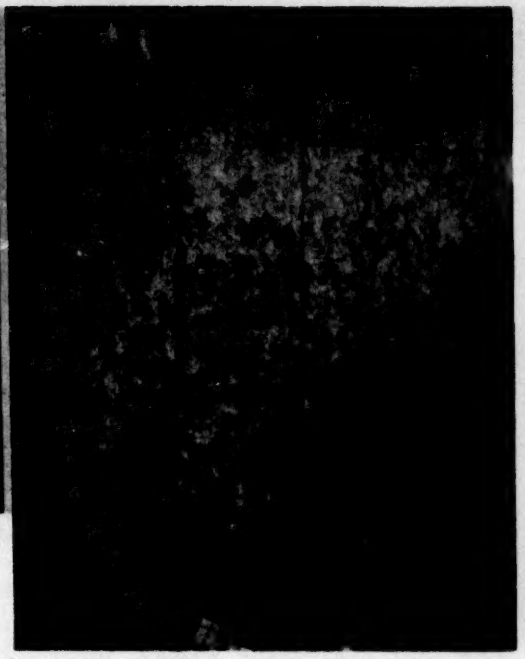
Storage Space

The warehouse includes 100,000 square feet of floor space divided into four equally sized rooms and an equipment area. Two rooms are on each side of the equipment space where the refrigeration machinery is housed. Fire walls were constructed between rooms to meet the requirements of the insurance companies.

Insulation

The building is of concrete block and brick construction with a steel roof deck. Insulation forms a complete envelope inside the structural parts. In floor areas, two layers of Fiberglas AEF (asphalt enclosed floor) Board, each four inches thick were installed between two concrete slabs. The 800,000 board feet of AEF Board was applied in flood coats of hot asphalt.

Walls were insulated by installing vapor barrier paper in cold asphalt adhesive then applying two four inch



Above: Interior walls of the new warehouse of Pasco Packing Company were finished with perforated masonite board 1/8 inch thick.

Right: The second layer of four-inch thick Fiberglas PF insulation being applied to a wall.

layers of Fiberglas PF (preformed) insulation, each layer supported by treated wood girts and studs. Partition walls were insulated in a similar manner with a single layer, four inches thick on each side of the wall.

The walls are 26 feet high to the roof deck. A total of 124,000 square feet of four-inch Fiberglas PF insulation, or nearly 500,000 board feet, was required to cover the walls. Four layers of roof insulation, each 2¼ inches thick, were installed in roof areas to a total thickness of nine inches. Amount of roof insulation used approximates 900,000 board feet. The vapor barrier paper on the walls is joined to the built up roofing to form a continuous barrier. An expansion joint of one-inch thick Fiberglas pre-formed insulation was installed between ceiling panels and the wall insulation.

Interior Finish

The interior was finished with perforated Masonite boards, each ⅛ inch thick, nailed to studs and joints covered with narrow strips. To insure a complete envelope of insulation, Fiberglas pre-formed insulation was installed behind wooden studding and an eight inch thickness of insulation was applied beneath columns supporting the roof.

The only contractors on the construction of this warehouse were Earl Singleterry of Dade City, who contracted the masonry work, and Asbestos Insulating Company of Tampa, who contracted to supply and apply the Fiberglas insulation.

Suppliers of major equipment and insulation were: Owens-Corning Fiberglas Corporation — Insulation; Frick Company—compressors and pressure vessels of the ammonia refrigeration system; Niagara Blowers Company—Niagara No-Frost Evaporators—supplied through Crawley-Gorbandt, Distributors, Atlanta, Ga. Allis-Chalmers Company — All motors supplied through Tampa Armature Works of Tampa; Cutler-Hammer Company—Automatic controller and motor starters; Sporlan Valve Company—All thermostatic expansion valves and level-masters. Refrigeration Specialties Company—All Solenoid Valves.

The officers of Pasco Packing Co. are: J. T. Lykes, president, W. F. Edwards, vice president and general manager, L. C. Edwards, Jr., H. S. Massey, L. C. Hawes, Charles Bradshaw and Robert Wooten, vice presidents, and Ansley Watson, sales mgr.

Refrigerated Warehousemen Launch Safety Campaign

THE first phase in the development of an extensive industry-wide safety program in the refrigerated warehouse industry has been launched by the Safety Committee of the National Association of Refrigerated Warehouses.

A. R. Carstensen, chairman of the committee, said that the primary objectives of the project will be to determine the types of safety programs already in operation by individual warehouses; the most frequent types of accidents; the employees whose work makes them the most susceptible to injury; and the amount of man hours lost through injuries suffered on the job.

"An immediate goal the committee is to set up safety committees in each of its seven chapters, to assure instant follow-up at the local level," Mr. Carstensen said.

Questionnaires have already been received by all of NARW members. The results, which will be announced later, are expected to point out the "weak spots" in the industry's present safety program, and indicate to the Committee where it should concentrate its efforts.

Mr. Carstensen, who is president of the Crystal Ice and Cold Storage Company, in Sacramento, California, is one of the refrigerated warehouse industry's foremost exponents of proper safety practices. His work in this field has contributed greatly to the industry's present awareness of the importance of proper safety precautions. His philosophy is: "If we can't afford safety, we can't afford to be in business."

Fruit Warehouse Burned

THE cold storage fruit warehouse of Majonnier & Sons, Inc., at Cherry & Spokane Streets, Walla Walla, Wash., went up in flames early in October. Loss was estimated at about $100,000.

Washington Apple Houses Add Space

YAKIMA Valley apple growers, anticipating a substantially better crop than last year, will have additional cold storage facilities this season totaling over a half million box capacity. Only one of the seven large cold storage warehouses built or converted this summer is on Yakima's Produce Row, with others located at Painted Rocks, Ahtanum, Weikel and Cowiche.

The cost of the construction and modernization program will probably total about $500,000. New storage facilities average close to $1 per box capacity and although conversion is less expensive the building program includes packing facilities as well as storage to increase the total cost. In some instances this year's construction is part of a program stretching over two or more years. All are of the most modern type, using lift-truck rather than conveyor loading and advanced designs of cooling equipment.

The W. E. Roche Company's new warehouse on South First Street was ready for operation late in September. Of concrete block construction with a truss-type roof, the Roche warehouse is 100 x 100 feet and adds 80,000 boxes to the company's cold storage facilities. A separate building houses the compressor equipment.

Cooling Equipment In Unused Space

Largest of the new warehouses is the Ackley Fruit Company's picturesquely-situated plant at Painted Rocks. The 94 x 124 foot cold room has a capacity of about 100,000 boxes, stacked to the trusses 20 feet above the floor level. The builder estimates space for two cars of apples was saved by the location of cooling equipment in what would otherwise be waste space above the trusses. The double blower unit will make it possible to divide the warehouse in two and use either half separately. The dome-like shape of the arched roof acts as a baffle to direct cool air downward.

The Ackley plant is completely new, with a packing room and office building adjoining the cold roof. The packing room is L shaped, an innovation in this plant, to permit re-arrangement of the packing line with a saving in distance from the end of the segregation area. The line is conventional, part of the machinery moved from the company's former location on Produce Row and part new, but instead of having the segregation area parallel to the line it is in the "L".

The movement of boxes after being lidded is at right angles, in the direction of the loading platform and cold room entrance, rather than doubling back as in most packing rooms. This variation in designs shortens the distance from the segregation area to the cold room by 100 feet, an important efficiency factor. Above the packing room and office is a large storage room, a lunch room for employes and lavatories.

Still to be completed at the plant is a spur from the adjacent Northern Pacific track and the blacktopping of the loading area between the tracks and the cold room.

New Plant Completed

The other entirely new plant in the area is being built by C. M. Hull on Ahtanum Ridge. The cold room is completed and work is going forward on the packing room adjoining. Located at the Hull ranch overlooking the Ahtanum Valley, the imposing concrete block building replaces a frame packing shed. Hull chose a square shape, 100 x 100 feet, because of the shorter aisle, cutting down the space which cannot be used for storage. Capacity of the cold room is about 75,000 boxes. The packing room, now under construction, is 40 x 140 feet and will contain mostly new equipment.

Two firms, Clasen Fruit and Cold Storage Co. at Ahtanum and Strand Fruit and Cold Storage at Cowiche, are adding to their present facilities this year. The Clasen brothers have added a 78 x 128-foot cold room which has an unusually high clearance, 22 feet to the ceiling trusses. This gives the plant a capacity of from 80,000 to 82,000 boxes. The compressors are located adjacent to the cold room and the blower equipment is to be enclosed in a separate room above the new office. The ducts are above the trusses. Also on the second floor will be a coffee room for employees and for growers visiting the plant. The office and coffee room will be electrically heated. New equipment has also been added to the firm's packing room.

A. D. and Ralph Strand are partners in the firm at Cowiche which is expanding its cold storage capacity by 65,000 boxes this year. Together with last year's addition, also a pallet-type operation, the Strands now have a total capacity of 195,000 boxes. The new building is of concrete block construction.

Just across the street from the Clasen plant at Ahtanum, the Yakima Fruit Growers have converted the Woodcock addition to their plant, acquired in 1945 and formerly a hardware store, to cold storage, increasing the capacity by 65,000 to 70,000 boxes. The remodeling and modernizing of the Ahtanum plant, according to W. L. Bode, is part of a quarter-million-dollar improvement program started last year on the Big Y's plants in the Valley.

The Co-Op proved last year in experimental work that the loading system using squeeze-type lift trucks, installed in the Ahtanum plant is not only workable but money-saving, causing less bruising, Bode said. The remodeled building at Ahtanum had used the belt system and remodeling included removal of that equipment, widening of the doors and removal of a floor in part of the building, making it one high room instead of two levels. A new unit type cooling system has been installed, and the more compact ducts further increased storage space.

The main plant at Ahtanum has also been modernized, work beginning soon after the first of this year, and Big Y plants at Weikel, Sawyer, Gleed and Grandview are also part of the improvement program. Work at Sawyer and Gleed was started last year.

Common Storage Converted

Clarence and Lloyd Hahn of Cowiche purchased the Yakima County Horticultural Union's common storage warehouse at Weikel earlier this year and have converted it to cold storage, with a capacity of between 85,000 and 90,000 boxes. The old plant was exceptionally well built, the new owners found as remodeling progressed, with 6 x 12 timbers supporting the upper floor and foot-thick concrete walls helping to insulate the cold rooms.

The plant has a two-level cold storage area, with separate blower equipment but using the same compressors in an adjoining part of the building. The newest type of cooling equipment installed is of great enough capacity to permit addition to the warehouse, the owners say, and there is ample space for any addition that might be made.

For this year, the Hahn Brothers packing shed will be maintained at the ranch near Cowiche but next year the porch on the Weikel plant will be removed and a new packing room built. Squeeze-type lift trucks are to

(Continued on page 60)

September 30 Cold Storage Holdings

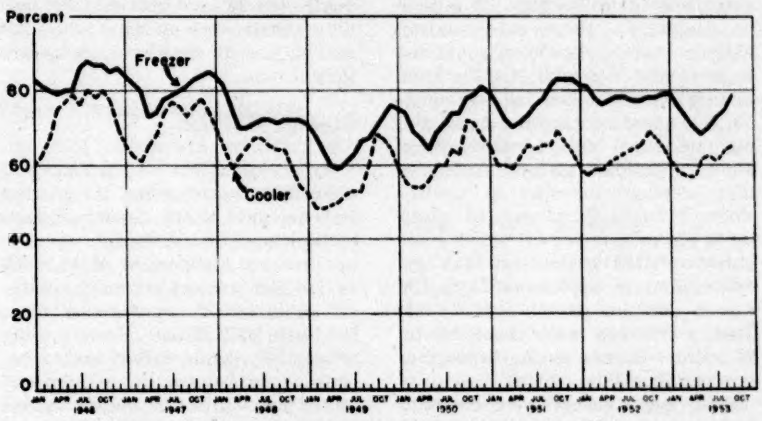
PUBLIC cooler occupancy was up to 65 percent on September 30, the same as a year ago but two points above average for this time of year. The occupancy gain over the previous month of one point was about average for September, yet all storage areas did not reflect this seasonal increase as in most areas there was little or no change from the previous month.

National freezer occupancy, likewise, increased by an above average amount during September. By the end of the month national use of public freezer space was 79 percent—a gain of 3 points. Last year, occupancy was 77 percent while 74 percent was average for September 30. This seasonal gain was reflected primarily in reports received from the New England, Middle Atlantic, South Atlantic, and Pacific Coast areas, while in the other areas freezer occupancy declined slightly or was unchanged from the previous month.

The net into-storage movement of fresh fruits, vegetables, and cheese brought national stores in cooler space to 1.8 billion pounds by September 30. The net accumulations of products moving into storage more than countered net withdrawals of dried and evaporated fruits, nuts, eggs, and selected meat items which resulted in a net gain in storage weight of more than .4 billion pounds. Stores in freezer space were the largest on record with 2.4 billion pounds reported on hand. More than half of this quantity was comprised of fruits, vegetables, and juices while dairy and meat products comprised a little more than one-fourth of the total freezer weight.

The September gain in frozen fruit holdings, 18 million pounds, was more than three times greater than average and about four-fifths greater than last year. Total stocks amounted to 369 million pounds which compares with 328 million in 1952 and 339 million pounds on September 30 in the 5-year period ended 1952. During September, holdings of apples, apricots, raspberries and Young, Logan and Boysenberries fell off slightly. Cherry stocks were reduced by 7 million pounds during the month while strawberry holdings fell off 6 million pounds to total 66 and 145 million pounds, respectively. Net storage gains brought stores of frozen peaches up to 26 million pounds and plums and prunes up to 9 million pounds. An eight million pound increase raised blackberry stocks to 19 million pounds while blueberry holdings, at 16 million pounds, reflected a 4 million pound increase. During September, orange concentrate holdings were reduced by 4 million gallons leaving 14 million on hand by the end of the month.

Stocks of frozen vegetables broke all previous storage records with 675 million pounds reported on hand September 30. These stores were about one-sixth greater than the previous record high (October 31, 1952) as a result of significant September net accumulations in stocks of lima beans, snap beans, broccoli, sweet corn, and miscellaneous frozen vegetables. The September net withdrawal of green



END OF MONTH OCCUPANCY OF PUBLIC COLD-STORAGE WAREHOUSES. 1946-53

TABLE I—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	Sept. 1953	Aug. 1953	Sept. 1952	Five Year Average
Beef	142,910	141,132	171,708	96,952
Pork	198,077	265,981	290,931	259,404
Other Meats & Meat Products	110,850	124,865	124,595	98,881
Frozen poultry, lbs.	175,763	127,340	182,786	146,026
Creamery butter, lbs.	323,693	334,853	111,319	141,447
American cheese, lbs.	425,499	410,733	231,503	226,826
Other cheese, lbs.	23,403	24,802	20,743	23,538
Shell eggs, cases	495	827	1,709	1,665
Frozen eggs, lbs.	110,056	133,427	123,661	146,080
Apples, bu.	8,231	509	6,221	8,145
Frozen fruits, lbs.	368,830	351,232	327,531	338,610
Frozen vegetables, lbs.	675,011	573,601	530,091	431,343
Frozen fish, lbs.	174,322	176,680	190,493	161,167

TABLE 2—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC REFRIGERATED WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu ft)		Sept. 1953 (%)		Aug. 1953 (%)		Sept. 1952 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	2,900	7,264	44	76	46	72	44	77	52	75
Middle Atlantic	30,800	37,430	64	81	58	80	63	84	58	78
East North Central	27,919	26,677	72	87	72	86	68	80	70	74
West North Central	11,963	20,322	65	75	65	76	62	60	70	67
South Atlantic	10,023	13,341	60	63	61	56	62	73	60	73
East South Central	2,761	4,333	84	79	85	79	89	88	80	87
West South Central	5,050	5,593	61	74	67	74	64	58	61	56
Mountain	1,300	3,029	45	68	43	62	64	81	58	77
Pacific	16,505	29,228	61	81	61	75	66	84	61	76
United States	109,221	147,217	65	79	64	76	65	77	63	74

peas, 13 million pounds, was almost twice the average net reduction and almost three times the reduction reported last year, yet September 30 stores of 218 million pounds were the largest on record for this time of year.

For the first time this year net withdrawals of butter exceeded net accumulations and by September 30 total stocks were down to 324 million pounds as compared with 335 million on August 31. Stocks of American Cheddar cheese, however, continued to increase and a total of 425 million pounds were reached by September 30. This quantity eclipsed the previous all-time record high of last month by almost 15 million pounds. A greater than average increase in poultry stocks brought September 30 stores up to 176 million pounds which compares with 183 million last year and 146 million on September 30 in the 5-year average period ended 1952. Turkey holdings were increased by 21 million pounds during September to reach 68 million pounds.

Shell egg holdings were down to 495,000 cases which compares with 1.7 million last year. Frozen egg stocks fell off to 110 million pounds as net withdrawals during September totaled 23 million pounds.

Holdings of beef totaled almost 143 million pounds on September 30 as compared with 172 million in 1952 and an average of 97 million pounds for this time of year. During September, stocks of frozen beef were increased by more than a million pounds to bring national stocks up to 134 million pounds. A net reduction of almost 68 million pounds brought stocks of pork down to 198 million pounds by September 30. Last year over 290 million pounds were on hand while 259 million pounds were average for this time of year.

Storage Outlook

By the end of October, public cooler occupancy should reflect its greatest seasonal gain if the 5-year average pattern prevails. According to past performance an increase of as much as five points is not unlikely as a result of increased use of cooler space for fresh fruit storage. Freezer utilization, too, should reflect higher occupancy on October 31, but the expected gain will not be as great as that indicated for cooler space. A rise of two points may obtain during October and, perhaps, more if frozen fruits, vegetables and poultry continue to move into storage in above average amounts.

Warehouse Fires

A SURVEY on warehouse fires published by the National Board of Underwriters reveals that the losses are of such proportion, and the potential so great as to demand national attention. On an average of at least once every week, it discloses a warehouse fire occurs, resulting in losses ranging from $100,000 to over $5,000,000.

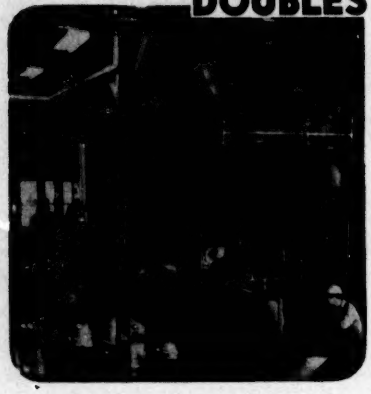
The survey makes numerous recommendations, including those for building construction, storage practices, maintenance and housekeeping, fire protection and salvage operations.

Great Lakes Chapter Elects

NEW officers for the Great Lakes Chapter of the National Association of Refrigerated Warehouses elected at their recent meeting in Highland Park, Ill., are as follows: President, William F. Fleig, Evansville Ice & Storage Co. Inc., Evansville, Ind.; Vice-President, David B. Stearns, Milwaukee Cold Storage Company, Milwaukee, Wis.; Secretary; Ed. DeGraff, West Michigan Dock & Market Corp.; Treasurer, W. C. Baker, Produce Terminal Cold Storage Co., Chicago, Ill.

FRICK Refrigeration

DOUBLES PRODUCTION OF RUBBER REACTORS



Synthetic rubber plants all over this country, and in Canada, are finding Frick special coils and controls the answer to the problem of cooling reactors. Vertical pipes flooded with ammonia, inside the reactors, replace sluggish brine jackets with trigger-fast cooling. This exclusive Frick development cuts reactor time in half—an unbelievable achievement!

What is YOUR cooling problem? Whether for process work, research, air conditioning, cold storage, or quick freezing, there's a Frick refrigerating system to suit your needs. Let us submit estimates now on your requirements. Branches and Distributors in principal cities: write, wire, phone or visit

Photos show Frick Ammonia Compressors, with 600-hp. motors; Frick Condensers, Receivers and Purger at Kentucky Synthetic Rubber Corp., Louisville, Ky.

FRICK CO. WAYNESBORO PENNA U.S.A.

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Circle No. 17 on Reader Service Card

Cold Storages Will Add New Freezer Space

A CURRENT survey of the public refrigerated warehouse industry has revealed a general optimistic business outlook, with warehousemen reporting plans to add 7,759,200 cubic feet of freezer storage space by October of 1954. Most of this additional space will be the result of new construction.

These tabulations from an industry-wide business opinion survey, being conducted by the National Association of Refrigerated Warehouses, indicate that most refrigerated warehousemen expect their business volume to hold steady during the coming months. Possibly, much of their optimism is based on the steadily increasing consumer trend toward frozen foods. Production of frozen foods is expected to reach 3½ billion pounds in 1953—an increase of 625 million pounds over 1952.

Of the total amount of freezer storage space to be added, the report showed that the warehousemen expect to add 3,334,200 cubic feet during the next six months, and 4,425,000 cubic feet during the following six months. During the same period, approximately one million cubic feet of cooler space will disappear as a result of conversions to lower (freezer) temperatures.

Over-all storage space in public refrigerated warehouses has been rising steadily for the past thirty years, with freezer storage space showing the biggest increase. Today, the industry is operating approximately 439,726,000 cubic feet of refrigerated storage space. Conservative estimates place this figure at about 450 million cubic feet by March of 1955.

New Florida Warehouse

A NEW warehouse of Griffith-Veldo, Inc., which will have a capacity of approximately 4,000,000 pounds of frozen foods, is under construction just south of the Broward County line, Miami, Fla.

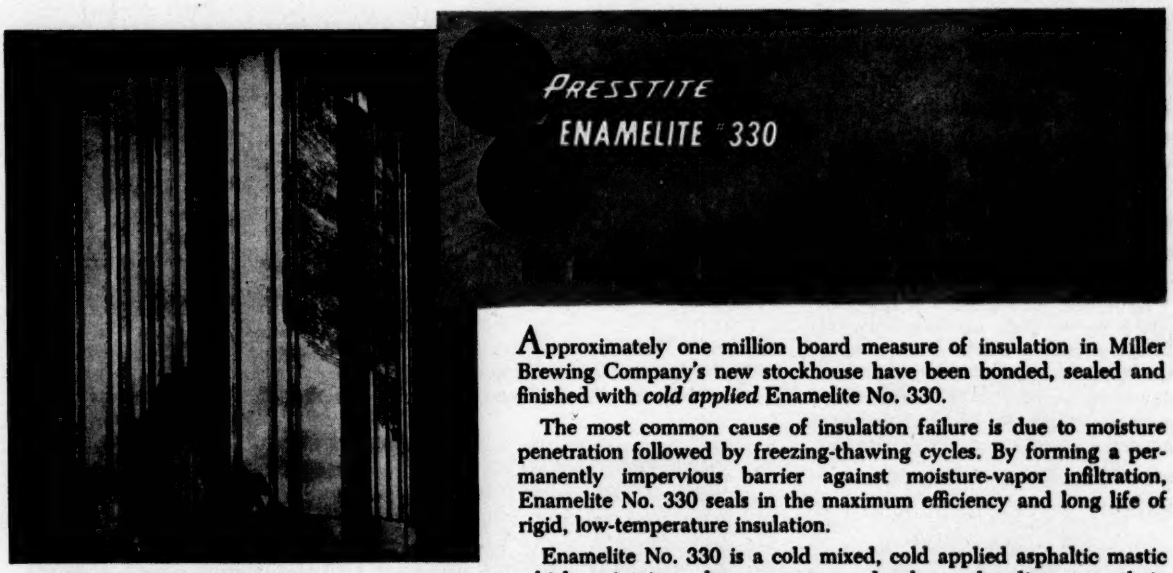
Officials said shipments will be received on a private railroad siding on the north and worked through the plant in a straight line operation to the shipping dock on the south. Modern air-conditioned offices are cantilevered above the shipping dock on a strategic location for management control of operation below as well as to provide shelter for dock workers. Construction is expected to be completed this fall.

Commission Merchants Build Storage Plant

WORK will begin soon on a cold storage plant for the city's commission merchants, Dayton, Ohio, to store fresh fruits and vegetables at a cost of about $750,000. The plant will have 100 car capacity. The commission merchants announced they will purchase the old Pennsylvania Railroad freight terminal at 428 Washington St. and convert it into a food terminal, including the cold storage plant. Dayton Produce Terminal Market, Inc., an organization of the commission food handlers, has a contract to purchase the railroad property.

Fork Truck Safety

ALTHOUGH electric fork trucks are ideal for cold storage warehouse operations, the fact that their operation is so noiseless sometimes leads to accidents at aisle intersections and at corners. One warehouseman solved this problem, with an assist by Lewis-Shepard engineers, by putting ball bearings in the hub caps of each of his trucks. This provided a continuous, gentle jingling sound that all workers could recognize as an approach of a truck.



Approximately one million board measure of insulation in Miller Brewing Company's new stockhouse have been bonded, sealed and finished with *cold applied* Enamelite No. 330.

The most common cause of insulation failure is due to moisture penetration followed by freezing-thawing cycles. By forming a permanently impervious barrier against moisture-vapor infiltration, Enamelite No. 330 seals in the maximum efficiency and long life of rigid, low-temperature insulation.

Enamelite No. 330 is a cold mixed, cold applied asphaltic mastic which maintains volume constancy, develops a bonding strength in excess of 100 lbs. per square inch and remains tough, flexible and elastic indefinitely. It resists acids, alkalies, brine, salts and gases.

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Circle No. 18 on Reader Service Card

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Changes in Ice Plant Evaporators Produce Increase in Ice Making Capacity

L. P. REISS
Consulting Refrigerating Engineer
Dallas, Texas

IN 1940 THE NAPRE convention was held in Fort Worth, November 12-14. At that convention F. J. Bobby with the Union Ice Company, Watsonville, Calif., delivered a paper on the construction of flooded evaporators for stable operation. This paper was published in ICE & REFRIGERATION in January 1941. In a sketch which Mr. Bobby used he showed a Gay Coil. A twelve inch liquid header and a twelve inch suction header were connected to a thirty inch vertical accumulator. *(Fig. 1)*.

The author of this paper presented at the Dallas Convention credits an observation made at the 1940 Fort Worth Convention, as being substantially responsible for increased tonnages and lower operating costs in plants under his jurisdiction. Indirectly the information gained through attendance at the 1940 convention assisted greatly in the personal success of the author.

He stated that when this coil was operating at high capacity slugs of liquid ammonia would carry over to the compressor. While the plant was down for repairs they installed an eight inch drop leg between the two headers. He did not state how far from the accumulator this leg was placed. However after the change was made they had a more uniform condition of suction pressure. There was also an increase of five percent in the amount of ice produced. A similar job on a cold storage evaporator gave like results. Mr. Bobby also gave some good pointers with reference to flooded evaporator requirements.

After studying the information in Mr. Bobby's paper, I had the opportunity to embody some of his suggestions in a number of plants under my care. Most of these plants had hair pin bend coils with an accumulator located in one end of the ice or brine tank. A precooling coil in this accumulator precooled the ammonia before it was expanded into the lower header. Changing these coils to boiler type or Gay type would have been expensive. We however made changes to the headers and changed the location of the accumulator.

The changes to the headers were made by discarding the liquid header and lowering the suction in its place. We then installed a new suction header generally two inches larger in diameter depending upon the size of the plant and the original size of the header. The accumulator was taken out of the tank and reduced in length. Suitable openings were then made to install piping. The accumulator was

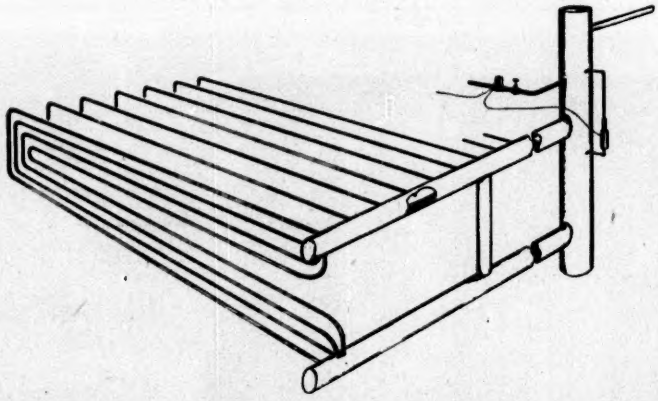

Fig. 1—Ice tank evaporator with connections between headers to provide free return to the lower header of liquid in the suction header.

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Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, an educational association.

L. P. Reiss

This author has been a member of NAPRE for 27 years. A graduate of the school of hard knocks, he was employed by Middle West Utilities, and Central and Southwest Utilities Companies for thirty years rising to the position of Superintendent of Ice Operations.

He pioneered the formation of the Technical Committee for the Study of Refrigeration Problems sponsored by the Southwestern Ice Manufacturers Association, of which he is a past president. In the fall of 1944 he went into business for himself specializing in rehabilitating old plants.

TABLE 1. COMPARISON OF TONNAGE AND COSTS AFTER CHANGES IN ICE PLANT EVAPORATORS.

Increased Tonnage	Average Fuel & Power Costs
	1944—.635
1945 over 1944—43,760 tons	1945—.589
1946 over 1944—62,635 tons	1946—.577
1947 over 1944—55,300 tons	1947—.564

(Total produced in 1946, peak year, 225,016 tons.)

then elevated above the tank and supported by a liquor leg which rested on a plate in the bottom of the tank.

The ammonia expansion line enters the accumulator at the same level that the suction lines from the coils enter. The flash gas passes immediately to the compressor and the liquid ammonia flows by gravity to the lower header and then to the coils. Sharp turns in the feeder lines are reduced as much as possible so as to reduce friction. These feeder lines from the liquor leg to the lower header are ample in size for the same reason.

Oil Drains

Four or more oil drains were provided. The liquor leg was extended into the accumulator several inches so as to form a pocket. A small oil pot with suitable drain was connected to this pocket. The small pot was not covered or insulated and when oil gathered in the pot the frost of the outside would leave. After the oil is drained out of the pot frost forms again.

The lower part of the liquor leg also serves as an oil reservoir. A suitable drain was installed in the leg and a pipe run up to above tank top level. The oil drains were installed in the lower header generally one at each end. The two lines were also run up to above tank top level. When these drains are all used the entire system may be kept free of oil.

All lines that carry ammonia liquid or gas to the accumulator should extend through the shell with openings pointing downward. The reduction in velocity and reversal of flow allows all slop over (ammonia and oil) to drop into the lower end of the accumulator. The oil being heavier finds its way into the oil pot provided for that purpose. If ammonia slugs are in the suction gas this ammonia will also drop out to be again returned to the coils.

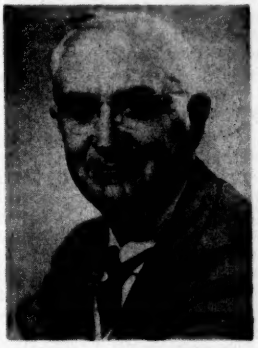
The suction line to the compressor or compressors also was extended through the accumulator shell to the opposite side with a wide slot cut out of the top. A drain was put in the end near the bottom to keep this line drained when the plant was not operating. A cone shaped screen was installed right below this line.

The improvement in efficiency and the increase in production after the changes were made were very pronounced. Information about these improvements soon attracted attention in the industry. In the fall of 1941 I was approached by the president of a company to supervise changes of this nature to a number of this company's plants. Accordingly on September 15, 1944, we started a program to make changes to 24 tanks. The plants were taken out of service gradually so that the demand for ice could be supplied from other plants by transferring or by purchase. The work required about five months to complete. By March 1, 1945 all plants were ready.

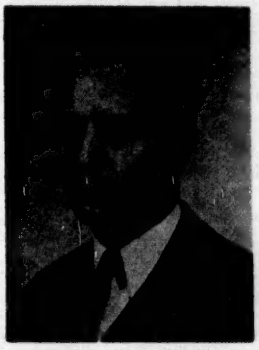
The increase in production and decrease in fuel and power costs as shown in Table 1 are from this firm's accounting department records.

Papers by Purdue Professors Highlight Annual NAPRE Convention

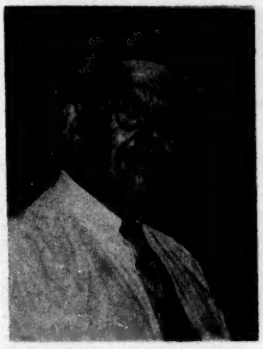
MANY colleagues of Professor H. G. Venemann have volunteered practical engineering papers and demonstrations in his honor for the 44th Annual Convention of the National Association Practical Refrigerating Engineers to be held at Purdue University, West Lafayette, Indiana, on Nov. 10-13. Prof. Venemann is being honored in this his retirement year with the selection of Purdue for the convention site by the NAPRE Board of Directors.



Prof. H. G. Venemann



Prof. H. L. Solberg



Prof. Wm. T. Miller

Welcome Address

The welcoming address to officers, delegates, members and guests of NAPRE, is to be delivered by Professor H. L. Solberg. A fellow in ASME and chairman of that Society's Main Research Committee, Prof. Solberg

Prof. C. S. Sprague

heads the school of Mechanical Engineering at Purdue, Prof. Venemann's Department. Prof. Solberg will express the pleasure of Purdue's Board of Regents at having NAPRE as guests again. Last convention held at Purdue was in 1949.

Prof. I. Walerstein

Opening Paper

Opening paper of the engineering sessions will be delivered by Prof. Wm. T. Miller, a long time associate of Prof. Venemann's. A member of ASHVE, Prof. Miller, instructs in

Prof. A. R. Spalding

heating, ventilating and air conditioning at Purdue. He was voted the best teacher award by Purdue students in 1944. His topic is "Air and Vapor Mixtures, and Migration Problems." His talk precedes an insulation symposium.

Demonstrations

On Wednesday, November 11, two demonstrations under direction of Professors Sprague and Walerstein, will be witnessed. "Artificial Lightning Demonstrations, and Protective Devices" is the title of the laboratory exhibition by Prof. Sprague, Supervisor of Purdue's High Voltage Laboratory. Lightning damage to quite a few large refrigerating plant motors and electrical equipment inspired this display and lecture.

Requests from practical operating refrigeration engineers for a review of basic physics will be satisfied in the exhibit and lecture of Prof. Walerstein. Subject of the demonstration is "Down to Earth Physics". Location of this feature will be in the Physics Laboratory Lecture Room.

Selection of Pumps

On Wednesday also, delegates and guests will take in a discussion "Selection of Pumps for Refrigeration Service", by Prof. Spalding, this year's winner of "Best Teacher's Award". Prof. Spalding will return to Purdue from Wilmington, Delaware, especially for this convention. He is "on loan" from Purdue to E. I. duPont de Nemours Co., for their program "Engineering Educators in Industry."

Prof. O. C. Lascoe, Public Safety Institute, Purdue, will deliver a talk on safety. Prof. Lascoe has just completed a series of lectures at M.I.T., entitled "Good Housekeeping for Engineers." The stag dinner speaker will be Prof. Fred N. Andrews, Dept. of Animal Husbandry, Purdue. His topic will not, of course, be an engineering subject.

Arrangements with Purdue University are under the direction of Prof. M. M. McClure, Assistant Director, Adult Education Div., with Keith E. Glancy, Conference Supervisor, in charge. Publicity of the affair is under the direction of T. R. Johnston of the Purdue University News Bureau.

News Notes and Chapter Activitives

Los Angeles

FRED HERR

LOS ANGELES Chapter of the National Association Practical Refrigerating Engineers opened its fall series of meetings with a Ham-and-Beans Dinner and entertainment program at the Terminal Club on the night of September 16. Among the 110 local members and guests were four visitors from Colton (Calif.) Chapter: L. G. Schroeder, F. J. Scherer, E. H. Carlson and Burt Todd.

The trophies won at the Chapter's summer golf tournament were presented to the winners by President Frank Muzzy. Frank Eccelston of California Consumers Corp. received the cup for low-gross winner; R. L. Maple of Union Ice Company, for runner-up; J. P. Johnson of All-Lube Corp., for low net, and William F. Losch of the Frick Company for low net runnerup. Golf Committee chairman Frank Eccelston announced that the tournament will again be held next June, with the Montebello Golf Club as the site.

Membership Chairman W. R. Burnett reported that 38 new members had been enrolled, as of September 16. He also called attention to the special drive the chapter is sponsoring during the closing weeks of the campaign in which a choice of refrigeration books is being made available to each man bringing in three new members. Mr. Burnett reported that New Orleans Chapter is putting on a concentrated drive and that Los Angeles would have to more than double its present number of new members to compete with the Southerners.

The evening's program was divided into three parts. All technical discussion was eliminated for the night. A social hour with singing and piano renditions started at 6:00 p.m. This was followed by cafeteria style ham and beans dinner at 7:00 p.m. Entertainment committee chairman Ed L. Nelson of the Union Ice Company took over as master-of-ceremonies at 8:00 p.m. and introduced the various vaudeville features.

The first fall business session and technical meeting was held at the Terminal Club on the evening of October 7. Forty members and guests attended, among the visitors being Frank Cardoza of San Francisco, vice-president of California Chapter No. 1. Past-president Edgar M. Marrs pinch-hitted as secretary for vacationing Donald Byl. The national association's emphasis on Brewery Month was reflected by the presence of some ten or twelve members and guests from the engineering staffs of Southern California breweries.

Eight new members were admitted at this meeting, Committee Chairman W. R. Burnett reporting that the Chapter's total to date was still insufficient to guarantee victory in the national drive. The names of recent graduates in refrigeration course at San Jose State College, San Jose, Calif., were read off and offered as prospects for NAPRE membership.

Regis Gubser of the Califorina Consumers Corporation announced that two night classes conducted by NAPRE members were being offered at the Frank Wiggins Trade School in Los Angeles. Gubser serves as instructor for a class in "Electricity for the Operating Engineer," which meets every Thursday evening between October 1 and mid-February. A Wednesday night class offering instruction in water treatment and chemicals is directed by George Paulick of California Consumers Corp.

The speaker at the October 7 meeting was Regis Gubser of the California Consumers Corporation. He presented an illustrated talk, amplified with engineering diagrams, of a new model freezing plant and storage warehouse recently constructed in the Los Angeles area. The one-story, 350,000 cubic foot refrigerated building

was completed within 100 days, Gubser reported.

The preliminary class, beginning at 7 o'clock, was conducted by Alex M. Shears, refrigeration instructor at the Wiggins Trade School. The discussion dealt with Chapter No. 14, "Operating," in Guy King's text book on refrigeration.

Rio Grande Valley

ARMIN DONEIS

AT OUR meeting September 1, vice-president B. F. Wilson, Jr. presided. Highlight was distribution of the 1953 Operating Data Book. There was considerable speculation as to who might attend the annual convenvention and participate in the special recognition and honor to Prof. Venemann at that occasion. The Chapter secretary reported briefly on his wanderings in Wisconsin, along the north shore of Lake Superior, and Ontario.

Our Chapter has been convening regularly in our Club Room in La-Feria. Recent meetings have dealt chiefly with the many transitional adjustments made necessary for a number of our members by the transfer of the entire ice department of Central Power & Light Co. to the Southern Texas Ice & Service, Inc. However, we got back to our regular course of study, discussing compressors in Section 4, and dealing some length with shaft seals and stuffing-box packings.

At our September 15 meeting, vice-president Wilson again presided. The secretary read a communication from NAPRE Membership Chairman concerning our Chapter's quota and after some discussion all members were urged to rustle up new members. Instructor Muller shed some valuable light on the effective care and maintenance of valve-stems and packings of ammonia expansion and shutoff valves.

The Chapter invites all members visiting in Texas to call at their club room, Le Feria Ice Plant, Southern Texas Ice & Service Co., Le Feria. The Chapter meets every second Tuesday at 8:00 p.m. The secretary, Armin J. Doneis may be reached by telephone at Pharr.

Chicago

JOHN FORTI

THE Chicago Chapter met on September 22, at Chicago Engineers Club. President Bert McKenna opened with a presentation of a pen and pencil set to Clyde Stoval, a member who is leaving the Chicago area to resume his business as a piping contractor at Jackson, Miss. Mr. Stoval earlier this year declined nomination as vice-president of Chicago Chapter for this season.

Harold Michler took over the educational program in the absence of Gene Rytlewski, Instructor. The educational program consisted of a review of the Guy King course. A refrigeration cycle was drawn on the blackboard. After carefully going over every part of the system and analyzing each piece of equipment, questions following the first several chapters were answered.

St. Louis

KEN HOLADAY

TRADE secrets of a York service man were revealed in a sound film on Flakice installation and service practices at the St. Louis chapter meeting Monday evening, September 21. The York Corporation conference hall was filled to capacity for this meeting, the first of the new season. E. F. Edwards, District Manager, York, was host.

Speaker of the evening was M. A. Luck, York District Service Supervisor. Mr. Luck discussed the principles of the Flakice process, and described certain details of construction and operation of the small commercial units using Freon refrigerants. Other York hosts were C. S. McDorman, J. C. McDonald, A. E. Korte, D. B. Atkinson, Eugene Weber, V. D. Morgan, Brewer Glenn, R. O. Bair and John T. Dabbs.

John Dabbs, president of St. Louis Chapter, presided at the meeting. This genial group collaborated in serving a fine variety of refreshments, complete with assorted meats, Kloth's famous cheese, St. Louis beers, pop and coffee, following the meeting.

Recent improvements in the NAPRE official organ, renamed Industrial Refrigeration, were described by National Secretary Dick Kelahan. He also outlined convention program plans and reported tentative arrangements for several large delegations. Entertainment Committee Chairman Ed Lotte announced plans for the Fall family barbecue. Other committee reports were heard on membership from Gene Kessler, program from Gene Bishop and Operating Data Book from Ken Holaday.

Detroit

L. L. ADAMS

IT IS with deep regret that we were informed of the passing of Arthur A. Craddick, who was chairman of our Membership Committee. Funeral services were Thursday, October 1. Mr. Craddick recently underwent an operation for a brain tumor. We have lost a good member and a fine friend. Arthur Craddick joined NAPRE in 1949 and was supervising refrigeration engineer for Wrigley's Stores.

On October 12, a special meeting was held by the chapter. The National Secretary, J. Richard Kelahan, was enroute back to Chicago through Detroit at that time and desired to address the membership with regard to the National Convention. The usual dinner meeting was held at Carl's Hall. For the benefit of the National Secretary, this chapter initiated nine new members at that time. They are Robert E. DeRose, Harry Farrow, Amos Gingrich, Fred V. Hall, Bernard H. Janssen, Russell J. Lantz, Oscar Lundgren, William Sutherland and James D. Sines.

Following the initiation the secretary answered questions fired at him by the membership concerning the educational program, membership drives and chapter-national headquarters relationships. President Roy Burns presided and introduced the secretary to all hands.

Memphis

CHAS. CONLEY

OUR September 16 meeting featured R. R. Perine, Lubricating Engineer, Gulf Refining Co., who supplemented his remarks with a colored talking picture of how lubricants lubricate, how it does the job in various type of bearings, why the correct type of lubricant should be used for each type of bearing.

E. S. Boland followed with another color sound picture that gave the history of growing oranges and other citrus fruits in Florida. The vast groves that are in Florida were pictured, and a large orange and citrus fruit juice plant was shown in operation. Juices were extracted, frozen and handled from the grove to the drinker in this production.

George B. Partlow, Chief Engineer, Hotel King Cotton; Claude P. Smith, Chief Engineer, Wm. Lenn Hotel; Otto E. Maxwell, Assistant Engineer, Hotel Peabody and Alvin B. Irwin, Jr., Sales Engineer, Mid-South Oil Co., were elected to membership.

Members-at-Large

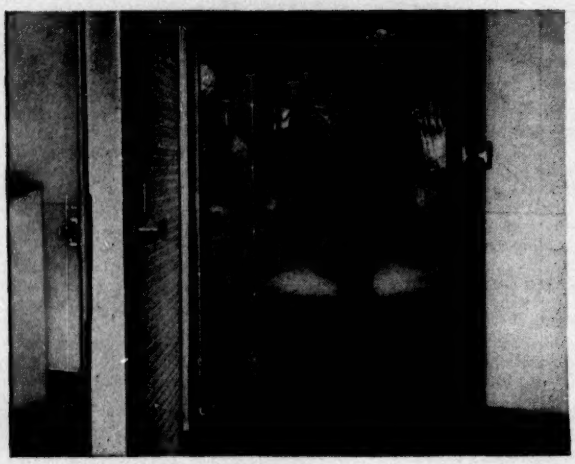
LEO J. VIVIEN

IT appears that member-at-large, Harvey Wishart, DePere, Wisconsin, will see a dream of his come true very shortly. Operating refrigerating engineers at Green Bay, Wis., met with the National Secretary on August 12 and September 30 for the purpose of organizing a chapter. The meeting in September ended with those engineers present petitioning the National Board of Directors for a charter. At that meeting Amos Vierbecker, assistant chief engineer, Badger Co-operative, was elected temporary president, and Jim Schouten, Schouten-Klockner Company, was elected secretary protem.

Plans were made to assemble a large delegation to attend the NAPRE Convention at Purdue with the hope that the charter might be presented as early as that date. The members then invited Bert C. McKenna, a national director, and president of the Chicago Chapter, to give a lecture before their group on October 21, on conversion of cooler space to freezer storage. This meeting will be held at the Larsen Co., Green Bay.

The Nation's capital may soon have a chapter. On October 7, at the invitation of Walter E. Bernd, a past president, the National Secretary addressed a gathering of 30 members-at-large in the Washington, D.C., Virginia and Maryland areas. The primary purpose of the Secretary's visit was to answer questions of these members in connection with forming a chapter.

J. W. Stockham, Vincent S. Peck and Robert L. Bland volunteered to act as a committee to arrange for a first meeting next month at which temporary officers are to be elected and a petition for a charter will be presented for signatures of those members desiring to affiliate. Following this business a discussion took place about the National Convention. It appears that quite a number of members from the Washington D.C. area will attend the sessions at Purdue.



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Circle No. 19 on Reader Service Card

N A P R E

Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

More on Mercury Column Manometers

QUESTION No. 964: The relative safety of Mercury Column Suction Gauges was brought up for discussion because several members had heard or read about disastrous explosions attributed to such gauges. Any reliable information as to the cause and effect, and the chemical reaction created by the combination of mercury and ammonia or lubricating oil would be helpful to us.—A.F.D.

ANSWER: Question No. 964 by A.F.D. in the September issue of Industrial Refrigeration intrigues me very much. I called the head of the Chemists Division of the National Bureau of Standards and asked for an opinion on this subject. He advised me that he knew of no hazard whatsoever in operating equipment in which the mercury came in contact with liquid ammonia or gas.

For thirty-odd years, I have been installing liquid ammonia meters of the manometer type for the measurement of the flow of liquid in refrigerating systems. I have also used mercury columns for indicating ammonia evaporating pressures ranging from zero to 45 pounds gauge. On pressures operating below atmosphere, I have used a U-tube for indicating the minus pressures. To the best of my knowledge, there have never been any explosions of any kind in the plants in which this equipment was installed and I am inclined to believe that where there had been a disastrous explosion, it was caused from some condition other than the mercury.—Walter E. Bernd.

Dual Suction Pressure

QUESTION NO. 968: Regarding your answer to Question No. 933 in the NAPRE OPERATING DATA BOOK, I should like greatly to be corrected on my method of figuring multiple effect compressors. (When operating on two suction pressures, 0 psig and 15 psig, is it better to use two compressors than one multiple effect compressor?—M.S.)

For years I have been figuring problems of this nature as a ratio of absolute suction pressures as follows:
Assume 0 and 15 psig suction pressures with NH, as refrigerant;
Then, 0 psig = approximately 15 psia, and 15 psig = approximately 30 psia.
15 divided by 30 = 50 percent.
Therefore, if total machine capacity is 2 tons, 50 percent of 2, or 1 ton, would be produced at 0 psig and 1 ton at the 15 psig level.

As you state in answer to 933, and no doubt correctly so, then 37½ percent of the total would be done at 0 psig and the remainder, or 62½ percent at 15 psig. I am therefore sending you one of my work sheets for your correction. The calculations were made by slide rule and are therefore only approximately correct.

Work Sheet

Compressor capacity at 0 and 15 psig suction with multiple effect compressor. The following conditions are assumed to hold true using NH, as refrigerant: Both suction conditions are taken to be superheated, 10 F; Volumetric

efficiency equals 75 percent; Discharge pressure, 125 psig; approximately 75 F liquid to evaporators; Swept volume of compressors 133.33 cu.ft/min.

Then: 133.33 × .75 = 100 cu.ft., net machine capacity in cfm; at 0 psig, NH_3 = .055555 lbs/cu.ft. × 100 cfm = 5.555 lbs NH_3/min; at 15 psig, NH_3 = .10720 lbs/cu. ft × 100 cfm = 10.720 lbs. NH_3/min; 10.720 lbs. NH_3 at 15 psig, minus 5.555 lbs. NH_3 at 0 psig equals 5.165 lbs. NH_3 handled by multiple effect.

With 75F liquid, one lb. NH_3 has 474 net Btu at 0 psig; one lb. NH_3 has 485 net Btu at 15 psig.

Then: 474 × 5.555/200 = 13.15 tons refrigeration at 0 psig, and 485 × 5.165/200 = 12.55 tons refrigeration done by higher suction pressure.

Added: 25.70 tons, total.

Same machine at 15 psig, straight suction pressure, no dual effect: 10.720 × 485/200 = 26.05 tons refrigerant.—R.C.H.

ANSWER: I find the discrepancy in our figures is caused by your assuming that the volumetric efficiency of 75 percent applies to the gas which enters at the 15 psig as well as that which enters at 0 psig. This is not the case. The 75 percent efficiency applies only to the downward stroke during the intake at 0 pressure. It is during this part of the stroke that the losses occur due to clearance and superheating. By the time the lower parts are uncovered, re-expansion has taken place, the cylinder walls have been cooled off and there are 133.33 c.f.m. of cylinder volume to fill up. During this period the volumetric efficiency is approximately 95 percent, so that the cylinder when full contains 13.57 lbs. per min. instead of 10.72, the figure you show in your example. The amount which came in through the high suction port is therefore 8.02 instead of 5.165.

This should give you 13.5 tons or 40 percent at 0 psig and 19.48 tons or 60.0 percent at 15 psig. I note that these percents do not agree with the 37½ and 62½ percents given in my original answer, but the original values quoted were not intended to be exact.

I am very happy to learn that you have been checking my figures in Ice and Refrigeration for the past several years and that your results have agreed closely to mine. I hope you can come over to Purdue for the convention in November. We expect to have a large attendance.—H. G. Venemann.

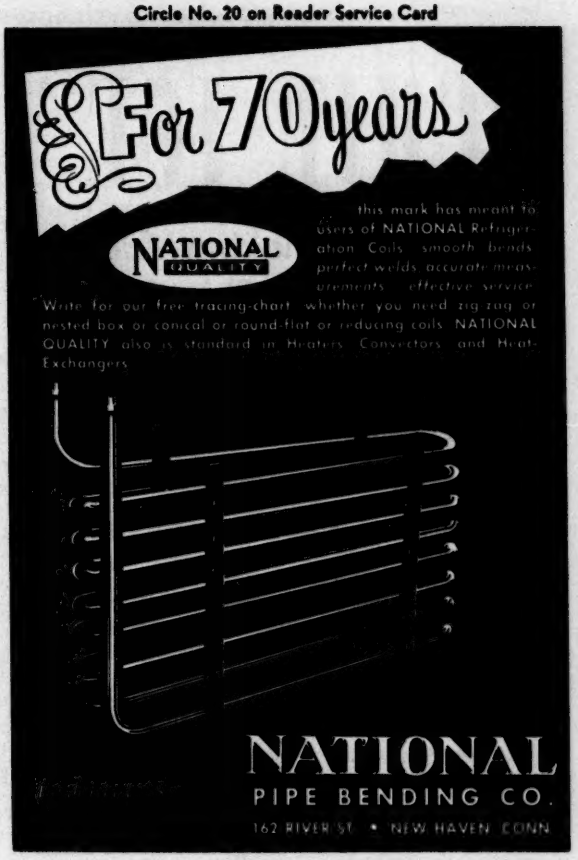
Capacity of Unit

QUESTION NO. 969: We are interested in having your opinion as to the capacity of a unit. It is a floor type, ammonia, direct expansion, fed from the top by an Alco multi outlet valve and is a water defrost unit. We would like to operate at a 7 degree superheat with a minus 10F refrigerant temperature. Unit handles 9000 cfm at ½ inch s.p. Air travel through this coil is 1500 fpm. The unit is to refrigerate a 0 F room. Coil Data: 16 pipes wide, 8 rows deep, 81 inches long, ¾ inch OD steel tubes with 2 inches square steel fins, 3 per inch; air movement is from bottom to top.—B.D.

ANSWER: I regret that I am unable to give you a reliable rating on the coil specified above. The basic information on fin coils at temperatures below freezing is very limited. My catalogues give excellent ratings on fin coils for air conditioning applications, but when it comes to zero temperatures they are very inadequate. I would have to depend upon the manufacturer's ratings with no opportunity to find out if they were correct until I put them in operation.

Letters from three coil manufacturers in answer to this question give the following ratings, 4 tons, 5 tons and 5.5 tons. All of them based their estimates on air velocity of around 480 ft. per minute because they considered the velocity of 1500 ft. per minute incorrect. They all mentioned that the capacity would depend upon proper liquid distribution through the coils as well as upon the frost and ice build-up on the surface.—H.G.V.

Circle No. 20 on Reader Service Card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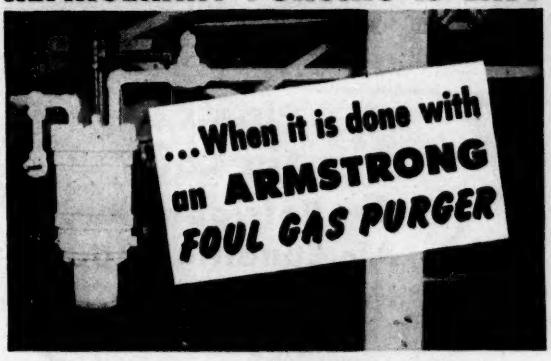

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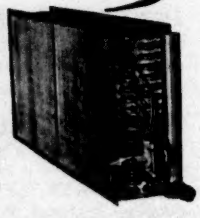

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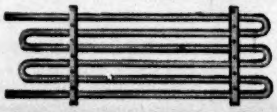

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Circle No. 23 on Reader Service Card

Explosion of Refrigerated Gases

QUESTION NO. 970: Would all the refrigerant gases that are classified as explosive, explode if mixed with 10 percent of air by volume?—L.R.

ANSWER: The inflammable or explosive limits of concentration when expressed in percent by volume of various refrigerants when mixed with air are as follows: ammonia, 16-25; butane, 1.6-6.5; dielene, 5.6-11.4; ethane, 3.3-10.6; ethyl chloride, 3.7-12.0; ethylene, 3.0-25.0; isobutane, 1.8-8.4; methane, 4.9-15.0; methyl chloride, 8.1-17.2; methyl formate, 4.5-20.0; propane, 2.3-7.3. The lower figure is the lean limit and the higher figure is the maximum limit. For example: propane if mixed with air in proportions by volume of less than 2.3 or more than 7.3 it will not burn or explode.—H.G.V.

New Questions

Efficiency Terms

QUESTION No. 971: What is the difference between the terms compression efficiency, mechanical efficiency, and adiabatic efficiency of a compressor?

Lowest Temperature

QUESTION No. 972: What is the lowest temperature that man has attained and how did he attain it?

Insulation to Block Heat

QUESTION No. 973: Can enough insulation be applied to a surface to prevent heat from following through it?

Special Report Classifies Turkey Storage Stocks

A REPORT compiled by The Institute of American Poultry Industries from members of the National Association of Refrigerated Warehouses, quotes inventory figures on classes of turkeys in storage October 15, 1953.

Reports were received from 243 warehouses, compared with 223 covered in the first report issued a year ago. Of these 243—70 had no turkeys in storage September 30 compared with 74 a year ago. The remaining 173 reported a total of 46,372,593 pounds of turkeys in storage at the close of business September 30, this compared with 53,750,470 pounds a year ago. This 1953 total includes 759,601 pounds of unclassified, held in seven warehouses.

The balance of 45,612,992 pounds, held in 166 warehouses in 107 cities in 36 states and Washington, D.C. (last year's report covered 106 cities in 36 states and Washnigton, D. C.) is classified in the first two columns shown in the following table and the second two columns give the revised report issued last year on October 14 which covered 150 warehouses. This report represents 67 percent of the total turkey stocks reported by USDA for September 30. Note that this year's figures show 92 percent of the turkeys were eviscerated, up considerably over last year's 71 percent.

POUNDS OF TURKEYS, CLASSIFIED, HELD IN REFRIGERATED WAREHOUSE STORAGE, 1953, 1952.

	1953 Pounds	1953 % of Classified	1952 Pounds	1952 % of Classified
Evisc. tom turkeys	16,428,732	36.01	13,561,568	25.59
Evisc. hen turkeys	20,611,831	45.19	19,647,152	37.07
Evisc. broiler-fryer type turkeys	5,031,838	11.03	4,289,608	8.09
N. Y. dressed tom turkeys	2,274,985	4.99	6,235,708	11.77
N. Y. dressed hen turkeys	1,265,606	2.78	9,265,129	17.48
TOTAL	45,612,992	100.00	52,999,265	100.00

U. S. Department of Agriculture To Be Reorganized

SECRETARY of agriculture Ezra Taft Benson has announced a proposed comprehensive reorganization of the U. S. Department of Agriculture. The reorganization proposal is made under authority of Reorganization Plan No. 2, enacted by the last session of Congress. That plan calls for advance notice of intention to reorganize. The proposal is scheduled to become effective after there has been opportunity for interested parties to comment on it. The proposals have been made after consultation with Congressional agricultural leaders, the National Agricultural Advisory Commission, representatives of the Land Grant Colleges, representatives of the President's Committee on reorganization of the Government, farm organization leaders, and others.

The new Department organization puts all of the service agencies of the Department under four main groups: (1) Federal-States Relations; (2) Marketing and Foreign Agriculture; (3) Agricultural Stabilization; and (4) Agricultural Credit. The four groups, the present Administrative Services group and the Solicitor will report administratively to the Secretary.

The Department as reorganized is designed to meet present day conditions, particularly in its emphasis on marketing and it will make it possible to administer the farm programs which current day agriculture requires, according to Secretary Benson.

Among major changes in the Department's structure the reorganization proposal would transfer the functions of the Production and Marketing Administration and the Bureau of Agricultural Economics to other services.

It is proposed that the Agricultural Research Service shall conduct all of the production and utilization research of the Department except forestry research. The research, inspection, disease and pest control work now in the bureaus of Agricultural Research Administration would be reorganized and regrouped. The aim is to gather together the research and the regulatory work from scattered locations within the present Agricultural Research Administration and thus provide two main activities with clear lines of authority, the research work in one group and the inspection and control work in another.

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ICE CRUSHER

The Bateman all steel MONARCH Model 50 Ice Crusher is galvanized for the prevention of rust. Slanting hopper for easy loading, with shelf for placing ice on before entering crusher. Hopper opening — 12½"x15". Uses 1 HP. motor with V-belt drive. All moving parts move on either ball or roller bearings. Gears are of alloy steel hardened for long life and trouble free. Steel shell, legs, grates, grate handle and alloy steel teeth. Belts and pulley furnished when crusher is ordered without motor. Side plates and bottom of hopper 3/16" steel.

Price $235.00, less motor. Motor at prevailing price.

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Ice Processing Equipment

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NEW LOW COST ICE CRUSHER

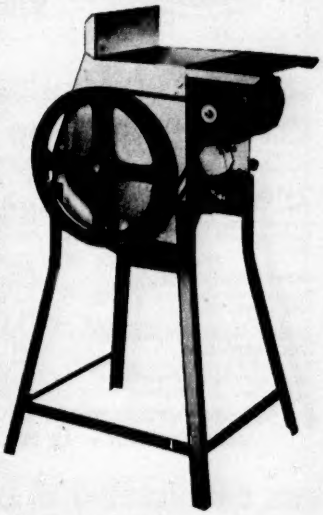
Bateman 25

CROWN

ICE CRUSHER

All-Steel Crusher For 25 Lb. Block Ice Crusher

... Ideal for Ice Stations — Vendors and Small Stores ...



Grinds 25 lb. block in 25 seconds with grate closed.

Four grate adjustments gives crushed ice from "pea-size" to 1½" chunks, by merely turning grate handle on side of hopper.

Galvanized for prevention of rust.

All-steel shell, legs and grate handle.

Belt driven, no gears, and self-aligning ball bearings.

Chute for filling containers.

Safety-shelf for block ice to be placed before entering crusher.

Guard covers flywheel, belt and motor pulley.

Only .....$125.00 with 1/3rd HP motor.

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Cause excess head pressure and reduced capacities.

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SUPER - HEATED REFRIGERANT DISCHARGE GAS.
Keeps discharge pressure high—increases power consumption.

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Reduce High Power Cost with this Rex Equipment.

REX AIR PURGER.
Removes all non - condensable gases. Holds down head pressure.

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Removes compressor oil and water vapors in the discharge line.

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Electrically driven. Cleaning time ¼ of hand scraping.

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Removes super - heat, lowering discharge pressure.

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National Frozen Food Convention

AN invitation has been extended by the National Frozen Food Convention Committee to all members of the frozen food and allied industries to attend and participate in the 1954 National Frozen Food Convention, sponsored by the National Association of Frozen Food Packers. The Convention will be held in New York City at the Commodore Hotel, January 31 to February 3, 1954.

The theme of the 1954 Convention is "Know the Score in '54," and to give real meaning to this theme, the National Frozen Food Convention Committee is arranging an outstanding program with emphasis on all types of frozen food problems including production, merchandising, promotion, warehousing, transportation and all phases of industry operations. Particular attention will be given to such important subjects as expansion of frozen food sales, development of pre-cooked foods and specialties, grading procedures, packaging problems and increasing efficiency of production and distribution.

The schedule of events on the program will follow the pattern of preceding national conventions. Registration begins Sunday noon, January 31, and the President's Reception will be at 5:30 p.m. the same day. There will be Industry Luncheons on Monday and Tuesday, and the Grand Banquet will be held Wednesday evening. Registration fee includes admission to all convention sessions, listing in the directory, tickets for the President's Reception and both Industry Luncheons. As in past years, banquet tickets will be handled separately. A limited number of display rooms will again be available for those companies that want special display accommodations.

Frozen Strawberry Pack for 1953

EXCLUSIVE of California, the 1953 pack of frozen strawberries amounted to 133,923,574 pounds, according to a preliminary tabulation by the National Association of Frozen Food Packers. This total was about 10 percent smaller than the 1952 pack.

Despite the reduced pack indicated above, total U. S. production of frozen strawberries in 1953 is expected to be greater than last year, and undoubtedly will establish a new record high. The California pack, still in progress and therefore not included in the preliminary tabulation, is running far ahead of last year and will more than offset the 10 percent decline in other areas.

The Southern pack declined sharply this year and production in the Northeast was a little smaller than in 1952, but moderate increases were recorded in the Midwest and Northwest.

Container size usage again indicated new trends. In retail sizes the 10 oz., 10½ oz. and 11 oz. classification represented more than twice as much tonnage as in 1952, and there was a corresponding reduction in use of the 12 oz. size. The pack in the 1 pound retail size increased significantly.

In the institutional and industrial sizes, the pack in containers of 10 pounds and under advanced nearly 32 percent, but production in all other larger sizes declined. The totals for the 30 pound size and for barrels dropped about 12 percent.

Meat Plant Burned

THE meat processing and locker plant of East Texas State College, Commerce Texas burned recently with an estimated loss of $50,000, although most of the frozen meat was saved. Heaviest loss was in power equipment and refrigeration machinery.

All Industry Exposition Plans for Big Attendance

INTEREST of all those in the air conditioning and commercial refrigeration industries will be centered in the Eighth All Industry Refrigeration and Air Conditioning exposition to be held at the Public Auditorium, Cleveland, Ohio, November 9-12. With exhibit space all sold out, visitors are assured of a complete showing of equipment. Sponsors of the big show are the Air Conditioning and Refrigeration Institute. Associations holding annual meetings in conjunction with the exposition include The Refrigeration Service Engineers Society, the Refrigeration and Air Conditioning Contractors Association, and the Refrigeration Equipment Wholesalers Association.

Both the Refrigeration Service Engineers Society and the Refrigeration Equipment Wholesalers Association will hold their annual banquets Sunday evening November 8, the RSES at the Carter Hotel and REWA at the Cleveland Hotel.

Annual Convention of RSES will be held at the Carter Hotel, starting Saturday afternoon November 7 and concluding Tuesday noon.

The Cleveland Association of the Refrigeration and Air Conditioning Contractors Association will act as host to visiting members at a cocktail party at the Carter Hotel, Monday evening, November 9.

Merchants Buy California Plant

THE Merchants Refrigerating Company of California, a subsidiary of Merchants Refrigerating Company, with headquarters in New York City, has purchased all of the outstanding stock of the Modesto Refrigerating Company, Modesto, California. This announcement was made by Arthur N. Otis, president of Merchants Refrigerating Company. With this purchase, Merchants has acquired one of the largest and most modern cold storage and quick freezing plants on the West Coast.

The Modesto plant is located in the San Joaquin Valley, a rich agricultural area producing vast quantities of vegetables, fruit, poultry and turkeys, much of which is frozen and stored at Modesto. It has a blast freezing capacity of 235 tons of produce per day with a storage capacity of 1,850,000 cubic feet. John Beard, former president and general manager of Modesto Refrigerating Company will continue as general manager, and with his same staff, will be in complete charge of the Modesto plant.

Mr. Otis stated that the Modesto plant is the first warehouse on the West Coast owned by the Merchants Refrigerating Company. It will provide a means of diversifying the geographical locations of the company and will enlarge the scope of Merchant's service to its customers in the important producing and consuming areas of the United States.

Including Modesto, the Merchants Refrigerating Company now owns and operates nine refrigerated warehouses located in New York City; Buffalo, N. Y.; Jersey City and Newark, N. J.; St. Louis, Mo.; and Hopkins, Minn.

Liquid, Dried and Frozen Egg Production

LIQUID egg production during August totaled 12,991,000 lbs., compared with 12,115,000 in August last year and the 1947-51 average of 24,298,000 lbs. Dried egg production totaled 1,959,000 lbs., compared with 1,140,000 lbs. in August last year and the average of 3,380,000 lbs. August production consisted of 1,111,000 lbs. of dried whole egg, 463,000 lbs. of dried albumen and 385,000 lbs. of dried yolk. Frozen egg production during August totaled 9,841,000 lbs., compared with 9,346,000 lbs. in August last year and the 1947-51 average of 10,972,000 lbs.

YOUR FUTURE MAY BE ON THIS PAGE!

You are an experienced manufacturer's agent, thoroughly familiar with the refrigeration industry and many of its branches. You are accustomed to well-above-average-earnings and you take enough pride in your profession that you will only represent the finest of products. If you fit this description, your future is on this page.

EXCLUSIVE TERRITORIES NOW OPEN TO REPRESENT Onazote EXPANDED HARD BOARD CELLULAR RUBBER THERMAL INSULATION

Internationally famous British Xylonite, Inc., is now embarking on a large scale program to further expand the American recognition of ONAZOTE as the finest commercial thermal insulation yet developed. Qualified manufacturer's agents will not only be offered unusually high compensation, but will also receive the fullest backing in national advertising, sales promotion material, etc.

THERE'S NO BETTER THERMAL INSULATION THAN Onazote

CONSTANT LOW CONDUCTIVITY—The lowest thermal conductivity of any solid material known (0.20 B.T.U.s).

STRUCTURALLY STRONG—Ideal for self-supporting insulating walls and ceilings and for panel construction. ONAZOTE will not settle.

MOISTURE RESISTANT—Aero moisture pickup. Also resistant to insects, rodents, rot, mildew, etc.

EASY TO HANDLE—ONAZOTE is light (4 pounds per cubic foot). It can be cut, drilled, planed, etc., with ordinary wood-working tools.

STANDARD BOARD SIZES—*(all thicknesses solid non-laminated.)*

2 inch thickness in 4' x 1', 4' x 3', 3' x 1'.
1½ inch thickness in 4' x 1'.
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Onazote IS NEEDED

in all refrigeration industries!

Here are just a few of the places where ONAZOTE may now be found . . .

ICE PLANTS • FROZEN FOOD LOCKERS
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THE POTENTIAL IS UNLIMITED!

Take advantage now of this unusual opportunity to reap big earnings with a top insulation product. Write for further information, including a brief outline of your past experience.

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Portable Chambers Keep Army Ammunition Cold

One of the new portable extreme-temperature conditioning boxes designed to store ammunition. Right, chamber opened to show arrangement of shelves.

EIGHT new portable extreme-temperature conditioning boxes soon will be on the firing line alongside the big guns at Jefferson Proving Ground, Madison, Ind. Designed to store ammunition at temperatures ranging from minus 100 F to 200 F, the huge boxes will aid the Army in studying the effects of temperature on the behavior of projectiles and small arms ammunitions. These chambers were made by Tenney Engineering, Inc., Newark, N. J.

Trailer Trucks Used

In operation, the 60 in. wide x 48 in. high x 108 in. long, 3350-lb chambers will be hoisted onto trailer trucks with sling and crane and hauled to designated firing locations. Here they will be unloaded, plugged into a 115-volt, 20-amp power supply and automatic controls set to maintain the desired temperature conditions.

When low temperatures are desired, dry ice is placed in containers located in a partitioned-off compartment in the rear of the chamber. An automatically-controlled damper built into the partition regulates chamber temperature by allowing more or less air to circulate around the ice, depending upon whether the temperature within the conditioned space is to be raised or lowered. The chamber will reduce the temperature from 90 to minus 70 F in 45 minutes and hold at this temperature for 18 hours without additional dry ice, far exceeding contract specifications. The equipment also includes two 12 cu ft portable dry ice storage boxes and two 54 cu ft boxes. The small boxes will be used to transport ice from the large stationary boxes to field locations.

Heating is accomplished by electric heaters also located at the rear of the chamber. Air is circulated around the heaters as in the case of the dry ice. Thermostatic controls turn the heaters on and off as the chamber temperature falls below or rises above the set value.

Six stainless steel expanded-metal shelves are provided within the chambers. Between the shelves and the two main doors, which are designed to provide full access to the work space, are four auxiliary doors, each covering one quarter of the entrance. These doors allow sections of the box to be reached without subjecting the entire compartment to the outside atmosphere.

The main chamber doors are so engineered that in case of an internal explosion they will open freely. All construction materials are non-inflammable. The chamber is so constructed that vibration and shock caused by gunfire will not affect its control.

Insulation is six inches thick and so installed that gunfire or transportation will not shake it loose. Lugs are provided so that sling and crane can hoist the box on and off trucks.

New Warehouse Adds to St. Paul Refrigerated Space

PLANS to build an $800,000 refrigerated building and increase St. Paul's cold storage capacity more than 50 per cent have been announced by Central Warehouse Co., 739 Pillsbury, St. Paul, Minn.

Construction of the building will start in a few weeks and work will be completed about May 1, 1954, according to Carl Bratnober, president of the company.

St. Paul's cold storage capacity now is an estimated 1½ million cubic feet. This building will have 950,000 cubic feet of space and hold about 15 million pounds of butter, eggs, poultry, fruits and other perishables. It is expected to be a boon to the Commodity Credit Corp. and the Army quartermaster corps, both of which have to go to points outside of St. Paul for refrigerator space, Mr. Bratnober said.

The building will face 267 feet on Territorial road and 150 feet on Vandalia. It will have its first floor 10 feet below surface and its second floor at dock-loading level. Of reinforced concrete and fireproof, it will stand on 100,000 square feet of the company's 30-acre plant site and be one of 33 buildings on the property. Its rear will have trackage on the Minnesota Transfer railway and its front will have truck-loading facilities.

Mr. Bratnober said 150,000 pounds of products can be frozen every 24 hours by blast, or deep freezing, at 40 to 50 degrees below zero, and then be removed to 10-below-zero storage. That freezing capacity represents about three carloads of butter and from three to four carloads of meat.

The entire freezing operation will be automatic, with around-the-clock control, and there will be completely mechanical handling of all products with electrified trucks and pallets.

Mr. Bratnober said the shortage in cold storage capacity in the Twin Cities has been serious for years. With rail connections to the Midwest's important railroads a large cold storage capacity in the Midway will serve a great need, he said.

National Ice Convention—Program Will Interest All Ice Men

THE program for the annual convention of the National Association of Ice Industries is rapidly taking form. The convention will be held at the Statler Hotel, Washington, November 17-20.

The program will deal with major industry problems aimed at presenting an array of counseling and speaking talent. The theme of the program is "Sell More in '54," and all of the subjects discussed will be geared to that idea.

Keynoter of the convention will be Lewis F. Gordon of Atlanta. Mr. Gordon is a dynamic speaker with a lot to say. For years he has served in top executive positions in the banking and marketing fields and was vice-president in charge of public relations and advertising for the Citizens and Southern group of banks in Georgia and as Manager of the Marketing and Sales Counselor Staff of McGraw Hill. One or more additional outside speakers also will be on the program.

Forum Sessions

Because of the interest shown in last year's one-day Forum, this year two big days are being devoted to this type of meeting.

In one session emphasis will be placed on merchandising and selling. Paul H. Andres, president of the Southwest Ice and Dairy Products Company, Oklahoma City will serve as moderator. He will employ the assistance of eight of the country's leading merchandising men to serve on the panel.

The second Forum meeting will be a Management Session, aimed at giving ice company executives and managers, supervisors, engineers, foremen and others an opportunity to discuss their problems. This meeting will be directed by E. L. Gunn, Jr., president of American Service Company in Atlanta. Mr. Gunn also will have a panel of eight practical icemen representing specific spheres of ice company management.

These forum sessions will afford all icemen an unusual opportunity to get answers to a lot of knotty problems. Many already have submitted questions. For those who wish to do so a blank is enclosed with the current "Ice News" published by the National Association of Ice Industries for their convenience when submitting questions or listing specific topics for discussion.

The Labor Situation

Another important attraction will be the address by the Hon. Samuel K. McConnell, Jr. of Pennsylvania. Representative McConnell is chairman of the powerful and important Education and Labor Committee of the House. He is concerned with all federal legislation and has a significantly vital and guiding role in determining labor's place in the nation's economy. His analysis of labor's position and labor legislation particularly wage-hour will be important and enlightening to every iceman.

One of the top safety men in the country, W. F. Leonard, Jr., of the Southland Corporation, Dallas, Texas, will be on the program to tell what has been and is being done on safety and accident prevention within the ice industry.

The association officers and staff will acquaint members with the association program and objectives and the progress which is being made. An analysis will be presented of developments within the industry and their significance and members will receive a firsthand up to the minute report on association projects which have been completed during the year.

Entertainment Program

One of the high lights of the entertainment program will be a visit to the White House which is located only a short walk from the Statler Hotel. The event will be held Wednesday morning of Convention week at 9 o'clock.

Another event of much interest will be a special safety tour of Washington at night to be held Tuesday evening starting at 8:00 p.m. from the Statler Hotel. On this tour members and guests will pass through the shopping and financial section, touring around the Pentagon, the national airport, stopping for a panorama view of luminous Washington, a view of the Jefferson Memorial, Washington Monument, Federal Triangle and a visit to the Library of Congress and other important places.

To top off the entertainment, a post-convention cruise down the Potomac River and Chesapeake Bay has been arranged. The steamer will leave Washington Friday evening, and return Sunday morning, visiting areas of historic Virginia enroute.

Ice-Men Develop Merchandising Ideas

THE Board of Directors of National Association of Ice Industries met in summer session in Chicago July 21-22. Merchandising and other ideas were discussed, including the following:

Because of recent staff changes, scope of the former Research and Engineering Department has broadened. To designate its activities more accurately, its name was changed to Research and Marketing. C. P. Austin remains Department Director.

Purdue University is in the middle of a study on the value of icing and hydro-cooling of vegetables for canning. Preliminary results are encouraging. A new project on fruits for processing was approved by the Research Committee. Eventually it is hoped the industry will benefit from new markets in this great field.

Current study of channel icing at Purdue is near completion, with favorable preliminary findings already on record. Though channels require less ice per foot of display than the ice bed method, they should materially expand the industry's potential vegetable icing business. To assist in disseminating the information and in selling the program, a manual of instruction is being prepared.

Sweet corn icing continues to grow. A report on last year's corn icing study by NAII at Ohio State University is now being prepared and will be made available soon. A similar study was conducted this year by Rutgers University. It was made available to the membership of the association. It too, has helped to spread word about the method among growers, agricultural workers and students.

Ice Air Conditioned Poultry Processing Houses

Air conditioning poultry houses with ice may be worth investigation of ice men. The National Association has been working with the University of Maryland on it. The problem to be solved: Losses run high in broiler houses during extreme summer heat. Solution: Ice can be used to advantage. Next year a project is being planned to explore the possibility of using ice in connection with hot air and hot water heating systems in these houses to reduce temperatures

below the danger point during heat waves.

The poultry-on-ice program is paying off with generous dividends for the companies that have pushed it hard. Ice companies in California's San Joaquin Valley have realized between 45 and 50 thousand tons of new business from this source, it was stated.

Water Treatment

A two-year project to learn the merits of ion exchange water treating method will be completed this fall. New and useful information is being developed. For one thing, ion exchange produces higher quality water than is needed for ice-making. Those conducting the tests recommend blending treated water with untreated water for a more economical operation. An ion exchange manual is planned for member company use. There will be more on this at the National Convention.

Hydro-Cooling

Peach hydro-cooling is really rolling! Time was when it was considered harmful to wet peaches. Research has shown this it not true. Icemen in many areas are profiting. One director added that Stericoolers in his locality increased from three to twelve in the past year. As a further result, shippers are using more ice in motor truck transportation of peaches. Some are now placing five additional blocks of ice across the rear of each truck load.

Icemen have been calling for equipment for large-scale automatic production of prepared ice. Such a machine will soon be in actual operation. In fact, the pilot machine is scheduled for exhibit at the National Convention in November.

Processed Ice

Processed or prepared ice is the big future market for the industry, members of the Board agreed. One director pointed out that 18 percent of American homes now have home freezers, and wide-awake icemen should be selling bags of cubed, crushed or sized ice, handy to place in the freezer. More advertising and merchandising effort is needed to push their sale.

Vendors, the "silent iceman" was generally applauded, but complaints were registered regarding some mechanical imperfections. Some of these are inherent, due to the "moisture" problem. Costs of repair can cut heavily into profit. Service failure brings customer ill-will. Purchaser of a vendor should recognize 24-hour maintenance problem. Nevertheless, it is worth the effort as a means of developing new and profitable business.

On Premise Cubers

In regard to combatting the on-premise cubers, more than one director advanced the opinion that superiority of iceman's ice is the best selling argument to use. Clearer, harder-frozen cubes last longer and look better. Also, the always-present possibility of breakdown in the machines can be stressed. One director reported this practice: When supplying ice in such "distress" cases, he makes a special delivery charge. Purchasers willingly pay it.

A board member from the West Coast has added worthwhile tonnage by supplying snow ice for shipment of flowers to eastern markets. Another told of his profitable business selling ice to a large grocery chain for cooling meat being transported by truck to the company's retail stores.

An ice company in a southern state handles household metal containers from its plant platforms including some 30 different kinds of metal cans, pails, sprinklers, waste baskets, garbage cans and the like.

A new air conditioning unit is now being produced specifically designed to utilize ice. It is made in 5, 10, 20 and up to 35 tons of daily refrigeration capacity. It is being used successfully in churches, clubs, lodges, funeral homes, etc.

Sanitation

The subject of sanitation came up for frequent discussion. Revision of the health and safety code relating to sanitation in the manufacturing and handling of ice in California was discussed. The new code was characterized as being very thorough. It was pointed out, however, that the ice industry's cooperation in revising the law resulted in provisions which are sound and with which the industry can comply.

A primary reason for inefficiency in the plant and high operating cost was discussed. Better training of operators is called for. The problem is one for the individual company to solve. Training is essential, but after training, operators often leave to join better-paying industries. Ideal answer for ice company owners appears to be the installation of automatic controls wherever feasible, replacing manual operation.

In Indiana, it was reported, the state university makes available a specialist who travels throughout the state conducting sales training schools for ice plan personnel.

Availability of Ice

Wise words were spoken by one board member, advocating all-out local effort in making known the availability of ice. Use newspapers ads, radio, television, printed circulars or pamphlets giving vendor locations, sales messages on paper bags, etc. Above all, he emphasized, stress the superior quality of iceman's ice.

Insurance rates, now high and going higher, cannot be dealt with on a national level, the board felt. Problems must be worked out locally. The best plan is to cultivate a close working relationship with the local insurance man, acquaint him with normal ice operations. In frequent cases this has brought benefit.

Commodity Storage Manual

THE new Commodity Storage Manual of The Refrigeration Research Foundation has been completed to date and is now available for distribution to members of the Foundation. The 23-page commodity storage list has been mailed, along with more extended discussions of commodities that comprise the manual in alphabetical order according to the key words. The manual is in loose-leaf form, so that additional mailings and revisions of the text made in the future may be inserted in proper order.

It contains a wealth of scientific and technical information on the handling and refrigerated storage of commodities, representing years of research work and the cooperative contribution of many commodity specialists. Available only to members of The Refrigeration Research Foundation.

Milk Industry Needs Refrigerated Delivery

THE milk industry needs "a practical method of refrigerating milk delivery vehicles," H. F. Judkins, director of the National Dairy Products Company, told the annual convention of the New York State Association of Milk Sanitarians held at Syracuse, N. Y. Mr. Judkins also stated that the trend in the milk industry is toward larger production units, using pipeline milkers, farm cooling tanks and tank trucks.

110 Million Pounds of Dairy Products Donated by USDA

THE U. S. Department of Agriculture reports that several large orders by private welfare organizations last week for butter, nonfat dry milk and cheese have boosted the total of the three dairy products either exported or scheduled for export under the Department's donation program to more than 110 million pounds. Orders the first week in October amounted to more than 31 million pounds.

The commodities are from inventories acquired since last December by Commodity Credit Corporation in supporting dairy producers milk and butterfat prices. Section 416 of the Agricultural Act of 1949 authorizes donation of price support commodities to U. S. private welfare organizations for free feeding to needy persons in the U. S. and in foreign countries.

Orders have increased the total amount of butter donated for export to 32,145,000 pounds of which 11,052,049 has been exported. The butter is from the 50 million pound quantity made available for donation by USDA on August 4.

An order for Cheddar cheese of which 50 million pounds was made available for donation amounts to 1,800,000 pounds by Hadassah for Israel. Recent orders for 13,260,000 pounds of nonfat dried milk solids bring the total for this commodity scheduled for export to 77,786,880 pounds, with 26,353,181 already exported. The dry milk was first made available for donation on May 4. Since that date the quantity available has been increased to 150 million pounds.

For foreign distribution, the products are available only to U. S. private welfare organizations registered with the Advisory Committee on Voluntary Foreign Aid (Foreign Operations Administration). The dairy products cannot be made available directly to foreign governments, foreign welfare organizations, or to private individuals either in this country or abroad. The three dairy products must be identified as a donation from the United States Government and must be used only for free distribution to needy persons.

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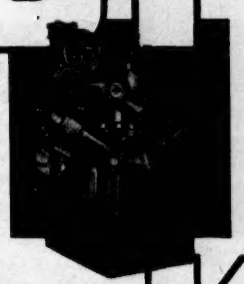

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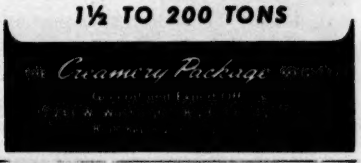

Sterling DEPENDABLE REFRIGERATION

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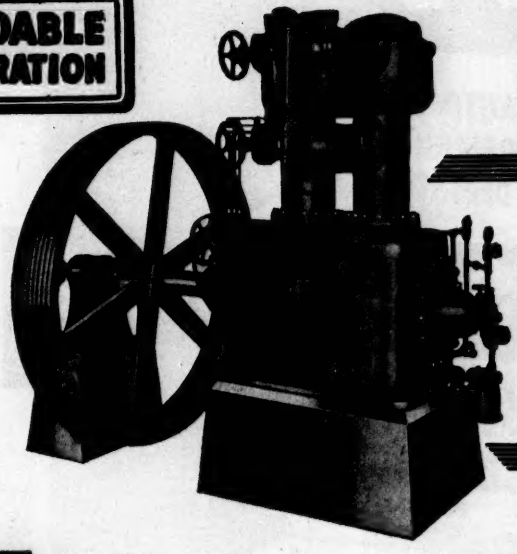
Place your order now for any of the wide range of STERLING compressor sizes. To provide for additional capacity . . . enlarged facilities . . . altered plant lay-out, look into the STERLING line. Engineered and built with advanced operating design features for efficiency and economy, rugged in the selection of materials for endurance. STERLING ammonia compressors are the product of more than fifty years of "know how" in the manufacturing of quality refrigeration equipment.



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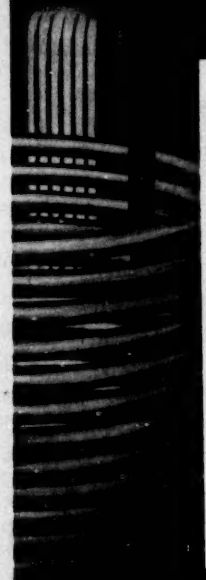

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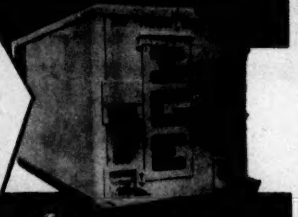

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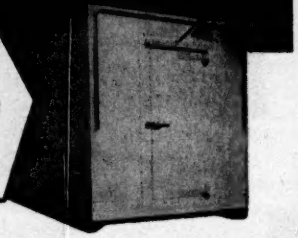

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Readers Ask

(Readers are cordially invited to avail themselves of the services of this column in INDUSTRIAL REFRIGERATION by submitting any question on the operation or other details of their plant or business.—The Editors)

Insulating the Suction Line

To The Editor:

We are adding another room to be held at about 30F. The suction line is to be 5 inch, approximately 130 feet long with 100 feet of it through another refrigerated room. The architect shows this suction line to be insulated all the way. I told him I did not think it should be, or at least was not necessary, but he says he always specifies insulated suction lines, that it is good practice. What do you think?—OPERATING ENGINEER.

REPLY: You are quite right. It is an unnecessary expense to insulate this suction line, and it performs little or no useful purpose. In our opinion there are many suction lines that are now insulated that would be just as well, if not actually better, un-insulated. They were insulated when installed, just because it was customary, and without any real consideration as to the value of doing it.

There are only two reasons for insulating a suction line: (1) To reduce the superheat in the suction gas and thus increase the compressor efficiency, and (2) to prevent drippage from the suction line.

(1) Theoretically, the efficiency of the compressor is the highest if the suction gas to it is saturated; that is, at the same temperature as the refrigerant in the cooler or direct expansion coils. Superheating of the suction gas reduces its intensity, and consequently the pounds of refrigerant that a compressor can pump.

In practice, the gas entering the compressor is rarely saturated. Due to load variations, the gas would fluctuate between being superheated or wet, and wet compression is no longer in favor.

From a practical point of view, it is desirable to have some superheat in the suction gas. It facilitates the separation and return of oil to the crankcase, and more important, it reduces the washing effect of the refrigerant that tends to dilute and wash the oil from, and thus adversely affect the lubrication of the pistons and cylinder walls.

It is usually good operating practice to have at least 15 to 20 degrees of superheat in the suction gas by the time it reaches the compressor. Even more than 20F superheat is tolerated if a heat exchanger is used to allow the suction gas to sub-cool the liquid to the expansion valves.

(2) It is often desirable to insulate the suction line to keep it from dripping on stored merchandise or in some air-conditioning installations, furnishings in occupied spaces.

If a cold suction line passes through a space whose dew-point temperature is above the temperature of the suction line, moisture from the air will condense on the colder suction line and the drippage will often cause damage, or at least it will be objectionable.

This is not true in your case. You did not mention the temperature of the room through which your suction line will pass, but if we assume that it is about 30F dry bulb and a relative humidity of approximately 80 percent, the dew-point will be about 25F.

In the new room held at 30F, the evaporator coils will probably not be held below 5 to 10 degrees. You only need to have 15 to 20 degrees superheat to prevent the suction

line from dripping in the room through which it will pass, and you would carry that much suction superheat in the normal course of operation.

Moreover, there is not enough surface of the suction line, nor enough temperature difference between it and the room air to affect the temperature in the room.

So there is little likelihood of drippage from the suction line passing through the room. We have made some assumptions as to temperatures and RH. If the dew-point is a good deal above 25F, and you think that there is some possibility of condensate dripping from the line, you can probably carry a little more superheat and still feed the coils fully. If necessary you can use a small refrigerant line heat exchanger, and get the benefit of sub-cooling the liquid.

Insulating one hundred feet of five inch pipe costs money, especially these days. It might look nice, but in your case, its cost would not be justified by benefits obtained.

There are, of course, instances, particularly those involving very long suction lines, or those in which the space through which the suction line passes is heated, where suction line insulation might be advisable. Even in those cases, the use of a heat exchanger and accumulator at the outlet of the coil and injection of liquid refrigerant into the suction line near the compressor is often preferable—particularly from a viewpoint of economy.

Aside from the unnecessary cost, insulation on suction lines may actually do more harm than good. Particularly on Freon-12 systems, insufficient superheating of the suction gas as a result of suction line insulation, is often an important contributing cause of compressor slugging.

Heat of Motors

To The Editor:

When we remodeled this spring, we put in two air-conditioning units; a five ton unit for the salesroom, and a three ton unit for the offices. They have worked very well, and we have had no trouble with them, but our engineer insists that the motors are running too hot and will not last long. The dealer that we bought the units from says the motors are OK and not to worry about them; that the motors on our units are no hotter than those on other units that he has sold for several years and which have given no trouble.

Our engineer says that a motor that you cannot hold your hand on is too hot. I tried it, and I could not keep my hand on either the three or five horsepower motors. He has been with us for almost twenty-five years, and takes care of all of our equipment, including the ammonia machine in the plant.

We want to get this settled before our guarantee runs out and maybe leaves us with two damaged motors that we will have to replace at our own expense. We would appreciate your advice.—SAUSAGE MANUFACTURER.

REPLY: Your problem is one that comes up quite often. Plant engineers are inclined to be critical of the temperatures of present day motors, particularly of motors used to drive the compressors of the smaller refrigerating machines. This is especially true of the older maintenance engineers who got their training in the days when motors were ordinarily loaded less heavily, and did not run as hot as they are customarily permitted to run now.

Twenty-five or thirty years ago, it was common practice for motor manufacturers to allow a 15 percent overload factor. This was merely a "lee-way" for accidental overloads, and it was not intended that it would not be taken advantage of in order to operate the motor with a continuous overload of 15 percent.

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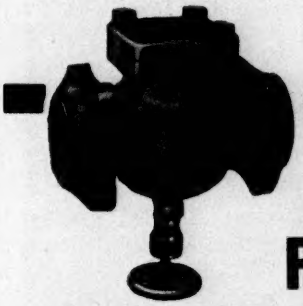

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Moreover, the motors on some types of machinery, such as machine tools for example, are not continuously loaded as heavily as the motors on refrigeration compressors. On many such machines the size of the motor is determined by maximum peak loads that occur for comparatively short periods, leaving the motor only lightly loaded a large portion of the time.

Manufacturers of refrigerating equipment are guided in their motor loading by the standards of the Underwriter's Laboratories of the National Board of Fire Underwriters. These standards very rightly put more emphasis on the temperature of the motor than on its overload on a wattage or current consumption basis.

The Underwriter's standards are rather involved, particularly in respect to the smaller motors that are equipped with temperature actuated, built-in overload devices, and especially in respect to motors in hermetic units.

However, your two units are probably equipped with three phase motors whose loading is limited by the overcurrent protective devices, usually referred to as "overload relays," in the motor starters.

The Underwriter's Standard provides that the heater coil in the overload relay shall be chosen so as to permit a maximum continuous overload of 25 percent of the full load current rating of the motor.

However, there is a provision in the Standard that may allow this 25 percent to be extended to 40 percent. Manufacturers of motor starters have only a limited series of sizes of heater coils, so it may not be possible to select a heater coil to limit the overload to 25 percent.

In such case, a heater coil may be used that permits an overload greater than 25 percent, provided that the resulting overload is not greater than 40 percent.

If we assume that the rated full load current per phase of your 5 hp motor for example, is 13.6 amperes at 220 volts, the heater coils would ordinarily be chosen to permit a maximum current per phase of 17 amperes (13.6 x 125%), although they might be as large as 19 amperes (13.6 x 140 percent).

On hot days, with the condensing water quite warm, and particularly if the voltage were a bit low, the units might be drawing current up rather close to the rating of the heater coils, and your maintenance engineer would probably be quite disturbed at the overloads that these motors would be carrying.

So much for overloads as reflected by current consumption; now for the maximum permissable temperatures of the motors.

Most continuous duty motors are known as 40C temperature-rise motors, which means that when fully loaded, their temperature will be 40°C (72F) above the temperature of the air around them, usually referred to as the "ambient" temperature.

The standard ambient temperature is 104F, so if the motor rises 72F about the 104F, the temperature of the motor would be 176F. This would be the normal full load temperature of the motor, as indicated by a thermocouple or a good thermometer puttied to the frame of the motor.

Not many of us would like to hold our hand on a motor or any other metal surface at a temperature as high as 130F. And yet a motor can be as hot as 176 and still be within safe limits at full load.

So testing the safe temperature of a motor by putting our hand on it is not a practical test, for it would limit the loading of motors far below safe temperatures, and cause us to buy larger motors than were necessary.

In fact, Underwriter's permit much higher maximum motor temperatures than 176F, depending upon the type of motor and the class of insulation with which it is wound.

Their permissible maximum temperatures are in the neighborhood of 220 to 240F, but for some types of motors and under certain conditions may be as high as 302F.

Although these maximum temperatures are mentioned, it is not to be inferred that there should be no attempt to control motor temperatures. Although great improvements have been made in late years in the insulation on the wire used in the motor windings, excessively high temperatures do very definitely damage the insulations and reduce the life of the motors. The motors should be kept clean, free of oil on the windings, but enough on the bearings, and should always have sufficient ventilation to enable them to dispose of the heat that they generate even in normal operation.

Studies of deterioration of the insulation of motor windings and of slot insulation, indicate however that modern motors are in no danger from overheating at temperatures under about 200F.

Maintenance of Pallets

UNDER "Operations Supplement," the National Association of Refrigerated Warehouses publishes a report by an eastern refrigerated warehouse on pallet maintenance. This report says their experience with pallets has been that purchasing pallets from a quality conscious manufacturer and made to proper specifications prevents pallet maintenance from becoming a problem. They specify drive screw nails for their pallets and these seldom pull out or otherwise fail. Most of their maintenance is the replacement of boards split and broken by one of, or, a combination of the following:

1—Pallet loads carried by partially inserted forks.

2—Rough manual handling of unloaded pallets.

3—Improper method of loading barrels on pallets.

As long as they have congestion and stress speed, they say they do not expect to eliminate these causes of pallet failure. However, they do keep the replacement of boards to a minimum by specifying sound hardwood for strength, no gum because it causes warping, and staggered predrilled nail holes to prevent the fasteners from weakening or splitting the boards.

During the daily operations, pallets which need repairs are put aside and later collected. When a large number of broken pallets have accumulated, one or two men are assigned to the repair work. They use precut wood and nails ordered from the same pallet manufacturer. They found that using the precut materials saves on both material and labor costs.

Other points of pallet usage are that, although they do not specify wood preservatives, they have not experienced any rot. They clean their pallets by scrubbing with hot water and a germicide, but state that steam cleaning is also good. The pallets will seldom require cleaning if, with certain obvious commodities, a sheet of paper is placed between the pallet and the commodity.

Frozen Food Convention and Exposition

SPONSORED by the National Wholesale Frozen Food Distributors Association, a frozen food merchandising convention and exposition will be held at the Waldorf-Astoria Hotel, New York, February 21, through February 25, 1954. Elaborate plans are well under way to provide an instructive and interesting exhibit and convention program. The convention committee is now lining up business panel discussions scheduled each morning. They have announced that they would like to hear from frozen food distributors as to what topics they would like to have explored.

USDA Ships Beef and Mutton to Greece

THE United States Department of Agriculture has announced the purchase of 3,522,000 pounds of frozen carcass beef and mutton for export to Greece under a Foreign Operations Administration program. Purchases of carcass beef (U. S. Utility grade) amounted to 3,354,000 pounds at average of 23.46 cents a pound, delivered f.a.s. port of Philadelphia. Purchases of carcass mutton (U.S. Utility grade) amounted to 168,000 pounds at 14.50 cents a pound f.a.s. Philadelphia port.

This quantity will provide the cargo for one ship to sail from Philadelphia sometime between November 15 and 30. Stepped up purchases of these meat products are for feeding the Greek Army in addition to a quantity for Greek civilians. The quantity was made possible by recent FOA increased meat purchasing program. The purchases bring total frozen beef acquired for export to Greece to 10,021,000 pounds since purchases began last spring. The mutton purchases the middle of October, it was announced, amounted to a total of 293,000 pounds.

Beef Prices Studied

THE United States Department of Agriculture is making a study of the spread between prices farmers receive for their cattle and the retail cost of beef. Object of the study, according to USDA, is to determine if there is any truth to charges that margins on transportation, processing, distribution, etc., are excessive. Because refrigerated warehousing is right in the middle of the distribution and marketing picture, the industry is interested in this study. A letter from the National Association of Refrigerated Warehouses to Secretary Benson points out that storage charges on beef and other perishable foods amount to an infinitesimal part of the ultimate price paid by customers.

Indoor Climate Control

AN indoor climate control has been installed in the new 11-story addition to the head office of Manufacturers Life Insurance Co., Toronto, Canada. It humidifies the air in winter and de-humidifies it in summer. The installation includes air conditioning, radiant heating and cooling, fluorescent lighting, acoustic control and a public address system.

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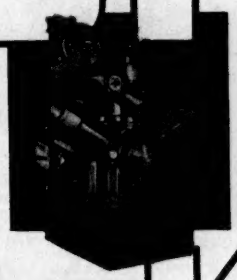

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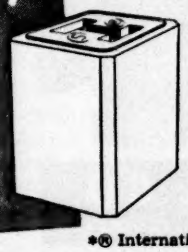

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• Kooler Kubes are special, heavily compressed 50-lb. refrigeration salt cubes for unit coolers, brine spray cold diffusers, and spray deck systems.

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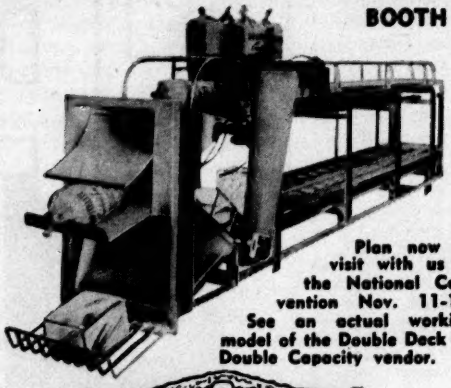
BOOTH 7



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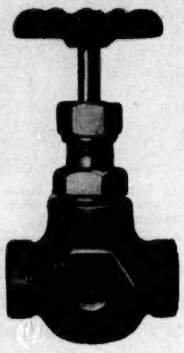

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COMING CONVENTIONS

CANADIAN ASSOCIATION OF ICE INDUSTRIES
November 2-5, 1953
Seigniory Club, Montabello, Quebec
MILDRED E. CROFT, Secy.-Treas.

REFRIGERATION AND AIR CONDITIONING EXPOSITION
November 9-12, 1953
Cleveland Public Auditorium
GEORGE S. JONES, Managing Director
Air Conditioning & Refrigeration Institute

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 10-13, 1953
Purdue University, Lafayette, Ind.
J. RICHARD KELAHAN, Secretary

NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 17-20, 1953
Hotel Statler, Washington, D. C.
GUY W. JACOBS, Exec. Secretary

DELTA STATES ICE ASSOCIATION
December 6-8, 1953
Arlington Hotel, Hot Springs, Ark.
R. N. MILLING, Secretary

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
December 6-9, 1953
Shoreham Hotel, Washington, D. C.
M. C. Turpin, Executive Secretary

NATIONAL FROZEN FOOD MERCHANDISING CONVENTION AND EXPOSITION
February 21-25, 1954
Waldorf-Astoria Hotel, New York, N. Y.
WILLIAM W. WALSH, Chairman convention committee

NORTH CAROLINA ICE ASSOCIATION
March 8-9, 1954
Sir Walter Raleigh Hotel, Raleigh, N. C.
LEWIS H. POWELL, Secy.-Treas.

Frozen Concentrated Milk

FROM the TRRF-aided project at the University of Minnesota, which has been in progress for several years under Dr. S. T. Coulter, comes a recent report summarizing the studies on the basic nature and properties of the coagulum that separates in frozen milk and on the factors affecting the rate and degree of destabilization.

In these studies, it has been learned that calcium is the major material responsible for destabilization and that lactose (milk sugar) has a considerable supplementary effect. The experiments suggest the commercial possibility of producing stable frozen concentrated milk by removal of part of the calcium by dialysis or by ion exchange, both of which are commercially feasible in large-scale operations. Since calcium appears to play this major role, a method has been developed in this project for the accurate measurement of concentrations of calcium (and incidentally magnesium) in milk.

The National Research Council of Canada in Ottawa, through Dr. W. H. Cook and Dr. Dyson Rose, has developed interesting and possibly industrially significant findings regarding the favorable influence of comparatively slow freezing or related practices on the reconstitution stability of frozen concentrated milk (whole and skim). These investigations are being continued.

Research along similar lines were initiated in September at the University of Wisconsin, under the direction of Dr. Walter V. Price, an immediate grant of $1000 having been made available for prompt initiation, from the short term investigation project funds of TRRF. The objective is to achieve reconstitution stability in frozen concentrated milk without the use of storage and distribution temperatures in the neighborhood of minus 20 F.

ASRE Annual Meeting December 6-9

THE 49th annual meeting of the American Society of Refrigerating Engineers will be held at the Shoreham Hotel, Washington, D. C., December 6-9. The meeting will get under way Sunday, December 6 with committee meetings.

Four general technical sessions and three specialized conferences of interest to one segment or another of the industry will be held; a technical research exhibit will be presented and a full program of social and sight seeing events have been arranged.

Through the technical papers a well rounded picture of advancement and general thinking throughout the industry will be presented. Some of the fields to be covered are heat pump developments, industry standards, various aspects of refrigerated warehouses environmental research, corrosion, the problems of excess moisture.

Conferences

Concurrently with the technical sessions, three conferences will be held. The domestic refrigerator engineering conference will stress recent developments in plastics for domestic refrigerators and freezers. The session will include discussion of some eight or ten types of plastic materials. The packaged air conditioning conference will deal with commercial and industrial applications; also the control of quality and manufacturing control of temperature and humidity in applications, performance and operating costs, and marketing programs as they affect the engineer. The conference on water conservation will cover general water and sewerage conditions throughout the United States and such equipment as cooling towers, evaporative condensers and air cooled condensers.

Research Exhibit

The research exhibit will be an important feature of this meeting. Some 25 exhibits will be on view at the hotel throughout the convention. One will explain the Peltier reverse thermocouple effect, the principle of the electronic air conditioner. Another will demonstrate the physical properties of metals at temperatures in the ultra low liquid helium range.

Entertainment for this meeting is being arranged by members of the Baltimore-Washington section. General chairman of the convention is Harvey W. Hottel, director of the Baltimore-Washington section.

Chicago Section, ASRE

THE speaker at the first meeting of the 1953-54 season Thursday, September 10, Chicago section American Society of Refrigerating Engineers was Leon Buehler of Creamery Package Manufacturing Company. Mr. Buehler, national vice-president, ASRE, delivered a paper on "Modern Refrigeration Practice in the Dairy Industry." The speaker traveled his audience from the cow and the farm to the varied dairy products and the consumer, via the dairy industry, showing the many refrigeration applications in this process.

In his talk Mr. Buehler showed why refrigeration was needed in the milk industry, through a description of the chemical makeup of this almost indispensable food product. He explained that the same water, carbohydrates, fats, protein, minerals and vitamins so essential to man, are very excellent food for micro-organisms. In this opening phase of the discussion he brought out the fact that the most important micro-organisms were bacteria, yeast and molds. Enzymes also contribute their part as chemical catalysts. He emphasized that the dairy industry is very interested in the elimination of some, and more interested in the control or culture of other micro-organisms.

One of the earliest steps in the history of milk producing and the dairy industry, and still the most important item to the industry today, is sanitation. Sanitation it was explained begins right at the cow. The speaker briefly described the parts played by health boards, inspectors, etc., in this important phase.

Balance of the talk was given to brief description of refrigeration applications in the transportation of milk from the farm to the dairy, refrigeration storage at the dairy, post pasteurization refrigeration and storage, refrigerated delivery to the consumer, and refrigerated storage by wholesalers, retailers and consumers. The description touched on modern methods of utilizing ice making and chilled water for latent heat refrigeration during dairy refrigeration demand peaks. One note of speculation which came into the talk, was the prospect of air-conditioning milk barns. It was pointed out that experiments are underway to determine whether "bossy" will pay for her air conditioning comfort by increased milk production.

ASRE Officers Nominated

AT the 49th annual meeting of the American Society of Refrigerating Engineers to be held December 6-9 at the Shoreham Hotel, Washington, D. C. one of the concluding events will be the installation of new officers for 1954. Election was by letter ballot of the following slate of officers offered by the Nominating Committee:

President, Arthur J. Hess, Los Angeles.

Vice-president, Leon Buehler, Chicago.

Vice-president, C. M. Ashley, Syracuse, N. Y.

Treasurer, H. F. Spoehrer, St. Louis.

Directors: R. H. Lock, Toronto, Canada; Fred P. Neff, Chicago; A. L. Hesselschwerdt, Cambridge, Mass.; G. K. Iwashita, Bloomfield, N. J.

Milwaukee Section ASRE

A PANEL discussion by citizens of four foreign countries featured the September 3 meeting of the Milwaukee section American Society of Refrigerating Engineers, with Felix J. Veliath of Madras, India, moderating. Other panel members were Haim Kammer of Tel Aviv, Israel; John Wood of Grand Turk Island, The Bahamas, and Fauld Irany of Jerusalem, Jordan. Mr. Veliath, a member of Milwaukee section, is currently studying engineering at Marquette University and training with the Vilter Manufacturing Company. He pointed out that the long periods of famine in India could be eliminated if enough cold storage plants were built to reduce spoilage of the seasonal food supply.

Dayton Section ASRE

A SECTION of the American Society of Refrigerating Engineers was formed at Dayton, Ohio recently and P. H. Mader of Chrysler Airtemp was elected executive chairman of the local group which has a charter membership of over 100. The new group plans eight dinner meetings during the meeting year.

Concentrate Supplies Short

REPORTS from frozen food packers and distributors indicate that concentrates seem to be gaining in consumer popularity. Market Research Corporation of America reports that retail sales jumped to 1,179,000 gallons for the week ending September 5. Average retail sales since January 1 have been 1,050,871 gallons.

News of PEOPLE

JERRY P. JOHNSON has been appointed sales coordinator for Merchants Refrigerating Company, New York, as announced by Arthur N. Otis, President of Merchants. The appointment is effective immediately.

Jerry P. Johnson

Mr. Johnson is a former president of the National Association of Refrigerated Warehouses and for many years has been Chairman of the Industry's Legislative Committee. He is also a member of the Department of Agriculture Liaison Committee and the Defense Liaison Committee. He was vice-president and general manager of Terminal Refrigerating and Warehousing Corporation, Washington, D. C. for 27 years. Having been in the refrigerated warehousing business for many years, he is well known in the perishable foods trade.

Merchants Refrigerating Company owns and operates nine refrigerated warehouses in New York City, Jersey City, Newark, Buffalo, St. Louis, Mo., Hopkins, Minn., and Modesto, Calif.

LUCILLE TEMPLE, for some years assistant to Wm. Dalton, executive vice-president, National Association Refrigerated Warehouses, is leaving the Association to return to Texas. The office will miss her personality and enthusiasm for NARW and its members. Taking her place will be Miss Susan Comfort, with an excellent trade association background.

C. F. BROOKS of Frigidaire Division, General Motors, Dayton, Ohio, has been appointed to the American Standards Association committee on the safety code for mechanical refrigeration. He will represent the Air Conditioning and Refrigeration Institute.

LOUIS HILL, ice company executive, Tallahassee, Florida, has been elected president of the Tallahassee Chamber of Commerce for 1954.

WALTER E. BERND has been elected vice-president and supervising engineer of the Terminal Refrigerating & Warehousing Corporation Washington, D. C., it was announced by James J. Hughes, president. Mr.

Walter E. Bernd

Bernd, a native of Texas, has been associated with the Terminal since 1926 in the capacity of supervising engineer. He is a past President of the National Association of Practical Refrigerating Engineers, a member of the District of Columbia Society of Profesisonal Engineers and the American Society of Refrigerating Engineers.

Mr. Berndt came to the Terminal from Fred Ophuls Associates, Consulting Engineers of New York City.

DEATHS

S. M. SCHWELLER, chief engineer of Frigidaire since 1937, died at his home in Dayton, Ohio, August 14. He was 58. Mr. Schweller had been associated with Frigidaire since 1921. He became general foreman of all assembly operations in 1925 and later was promoted to assistant superintendent of the Taylor Street plant. In 1928 he was named assistant chief engineer of product development and, when the department was subdivided, was put in charge of household development. He was assistant chief engineer again from 1933 until 1937. He is succeeded as chief engineer of Frigidaire by J. L. Gibson.

LEO A. BETZ, ice dealer of Newport, Ky., for 40 years prior to retirement, died October 4 in St. Elizabeth's Hospital in Covington. He was 76. He leaves a niece and two nephews.

JOSEPH SEIGLE, retired chief engineer for the Cincinnati Ice Manufacturing and Cold Storage Company, Cincinnati, Ohio, died August 31. He was 83.

O. E. HOERGER, an executive until 1943 of the Liquid Carbonic Company, died at St. Louis, Mo., July 24.

Book Review

AUTOMATIC CONTROL OF HEATING AND AIR CONDITIONING, by John E. Haines. 370 pages, size 6 x 9 inches, hard bound. Published by McGraw-Hill Book Company. Price $6.75. For sale by Nickerson & Collins Co., 433 North Waller Ave., Chicago 44, Illinois.

This is a practical book, devoted solely to automatic control as it applies to heating and air conditioning.

In a balanced presentation it brings to the reader on-the-job facts, progressing from an introduction to basic principles, through the construction and characteristics of representative control devices, to the combining of individual control devices into control systems for heating and air conditioning. As broad in scope and elementary in approach as is practical, the book provides information on measurement for purpose of control, transmitting control signals and actuating final control elements, electric and pneumatic control devices, control of domestic heating, commercial heating and air conditioning, unit heaters, unit ventilators, and radiant-panel heating systems. The book includes a short chapter on the special problem of automatic control for refrigeration equipment as used in air conditioning and a chapter on definitions of control terminology.

Cold Storage Plant Design

(Continued from page 30)

ices; 7) small packages, small lots and small withdrawals; 8) high cost of expansion and modernization.

There can be no doubt that the high cost of expansion and modernization bothers the refrigerated warehousemen. However, it is the writer's opinion, that expansion and modernization does not bother them nearly as much as does the increased cost of operation. It can be reasoned then that warehousemen will spend the money for expansion and modernization if it will cut their operating costs.

Washington Apple Houses

(Continued from page 36)

be used for loading at the remodeled cold storage plant.

Fruit storage of a different type, in cans, is being provided at the Horticultural Union's Terrace Heights Cannery. A canned goods warehouse 160 x 100 feet is being built at the rear of the plant's main canning room. The building is of pre-cast concrete, the walls poured in forms on the site and lifted into place.

MANUFACTURERS' NEWS

Carrier Establishes Operating Divisions

CARRIER Corporation will shortly have three major operating divisions, each of which will engineer, manufacture and market its own product lines. One of the three new operating groups will be the Unitary Equipment Division. This will handle product lines such as reciprocating compressors, room air conditioners, year-round residential units and other self-contained air conditioning de-

George N. Lilygren

vices. It will be headed by John H. Holton, vice president and general manager. The assistant general manager will be Russell H. Gray and the marketing functions of the division will be directed by John M. Bickel, vice president.

Carrier activities with respect to so-called heavy equipment will be assigned to the Machinery and Systems Division, which will engineer, manufacture and sell centrifugal refrigeration equipment, air and gas compressors, absorption machines, axial-flow compressors and, in general, all products that enter into air conditioning and industrial refrigeration systems of the central-station type. This division will be in charge of George N. Lilygren, vice president and general manager, who will be assisted by Charles V. Fenn, vice president.

The responsibility of the third operating group, Allied Products Division, will include food freezers, unit heaters, automatic ice makers and certain other specialty products. J. L. Fletcher will be general manager of this division.

Airtemp Donates Air Conditioning Equipment

MONTGOMERY county commissioners informed the Airtemp division of Chrysler Corp. in Dayton, Ohio that they accepted with "gratefulness" that firm's gift of air conditioning equipment valued at $40,000 now cooling Memorial hall. It will cost the county a $10,000 cost-of-installation bill. The gift includes four 15-ton portable air conditioning units.

Wright Appoints Dr. Bird

THE appointment of Dr. Paul G. Bird as Director of Research and Development is announced by Wright Chemical Corp. of Chicago, water conditioning specialists. Dr. Bird, who has a long and varied career in the field of chemical engineering, was in

Dr. Paul G. Bird

charge of research at National Aluminate Corporation for eleven years and was largely responsible for the company's development work directed toward diversification. Following his association with National Aluminate, Dr. Bird devoted several years to engineering consulting. Before entering the industrial field, he was a member of the teaching staff in the chemical engineering department of Iowa State College, where he had previously received his Ph. D.

Baker Advances Kauffman

V. E. KAUFFMAN, well known refrigeration engineer, has been elected vice-president and placed in charge of the Industrial Refrigeration Division of Baker Engineering Corporation, it has been announced by Charles E. Hollingworth, President of that corporation. Mr. Kauffman has spent more than thirty years in the refrigeration industry. He was granted an engineering degree by the University of Nebraska in 1919, his college education having been interrupted by a term of military service during World War I. He began his career in the refrigeration field as an engineer with the Frick Co. of Waynesboro, Pa. immediately after graduating from college. Two years later he joined the Baker Ice Machine Co. of Texas where he remained until 1937, at which time he was chief engineer of that concern.

He then moved to the parent Baker organization at Omaha as assistant chief engineer. In 1946 he returned to Seattle as vice-president and general manager of the Northwest Division from which position he resigned to move to St. Louis.

New Vending Stations

DURING the past month, the following companies installed S & S Vending stations:

Pure Ice Co., Daytona Beach, Fla.
Chas. A. Hoffman & Sons, Albany, New York (10 stations)
J. R. Foristiere, Fresno, Calif.
Ice Delivery Co., Tacoma, Wash.
All Seasons Ice & Cold Storage Co., Denver, Colo. (3 stations)
Richmond Ice Co., Richmond, Va.
Self-Surv Ice Co., Springville, Utah.
City Products Corp., Cleveland, Ohio (4 stations)
Home Ice Co., Petersburg, Fla.
Knickerbocker Ice Co., Elmhurst, N. Y.

Control Equipment Catalog

A NEW data book and catalog is now available to anyone interested in solving process control problems. A complete line of thermocouples, radiation detectors, and resistance bulbs are shown in Bulletin TC10, issued by Barber-Colman Company, Rockford, Ill. It has a great deal of valuable information concerning various sensing units as well as tips on instrument servicing. This new 42 page data book and catalog also includes information on protection tubes, lead wire and other accessories that are designed for use with indicating, controlling, and recording instruments.

For additional information, circle 57 on Reader Inquiry Card.

Circle No. 40 on Reader Service Card

CATALOGS AND BULLETINS

Bulletin On Liquid Seals

A NEW bulletin, No. 241, has been issued by Armstrong Machine Works telling how to keep high pressure refrigerant gas out of the evaporator when the liquid level in the receiver drops below the outlet pipe. It covers the operation, selection and installation of Armstrong cast semi-steel and forged steel liquid seals and expansion valves. Selection charts are included for ammonia, Freon and Carrene refrigerants.

For additional information, circle 59 on Reader Inquiry Card.

New Catalog on Electronic Controls

COMPLETE information on Barber-Colman Electronic Controls and Heating, Ventilating and Air-Conditioning is now available in a new catalog F 6166. The new catalog describes the flexibility of Barber-Colman Electronic Controls System. Descriptive information concerning the ultra-sensitive micro relay which simplifies the amplifier is also included. Only two tubes are required. Well marked dials incorporated in the control panel simplifies the making of adjustments, and practically eliminates complex instructions regarding operating procedure.

The new catalog also contains a complete description of the various elements required for system application and illustrations help to explain their usage.

For additional information, circle 77 on Reader Inquiry Card.

Folder On Insulation

A NEW four-page folder, "Foamglas, the Long-Life, All-Temperature Insulation for Tanks and Other Equipment" has been published by the Pittsburgh Corning Corporation. The folder presents the physical properties of the unique cellular glass insulation and lists the sizes and shapes available and recommended thicknesses required for temperatures ranging from minus 50 to 800 F. Condensed suggested specifications and photographs of applications make the folder an ideal reference for engineering and maintenance personnel.

For additional information, circle 53 on Reader Inquiry Card.

Catalog on J-M Products

A NEW 8-page catalog, "J-M Products For The Process Industries" has been issued by Johns-Manville. It gives concise data on the properties of the various products and includes photographs which show typical installations. It is arranged as a ready reference for men who design, install and operate process equipment. The products covered are industrial insulations for temperatures from minus 400 F to plus 3000 F; refractories and insulating brick for furnaces, ovens and kilns operating to 3000 F; transite pipe for overhead and underground water lines and for process lines handling corrosive liquids and gases; transite industrial vent pipe for venting gases, ducts, fumes and vapors; packings and gaskets including acid and caustic-resisting types; raschig rings for tower packings, and J-M Chemstone and Transite sheets for various types of fabricated equipment.

For further information, circle 71 on reader inquiry card.

Armstrong's Insulator

THE September issue of Armstrong's Insulator (Armstrong Cork Company) has an interesting article on submarines, the growing of yeast, cultivation of fingerlings, helicopters, prepackaged produce, materials handling in cold storage, and pipe covering.

For additional information, circle 63 on Reader Inquiry Card.

The Book of Refrigeration Knowledge

Basic Refrigeration

PRINCIPLES
PRACTICE
OPERATION

By GUY R. KING
Refrigeration Instructor
Santa Monica Vocational School

THE 29 chapters of this 500-page book contain a complete and simplified presentation of the fundamentals of refrigeration, giving equal treatment to all common refrigerants, design, operation and servicing of the apparatus and systems.

The author has drawn on a wide and varied experience in the practical aspects of refrigeration, coupled with many years of teaching the subject. BASIC REFRIGERATION is written in non-technical language and the author has recognized the requirements of the refrigeration engineer, installer, salesman, student and instructor, compiling the text in a manner which progressively treats the subject from fundamentals to complete systems.

The text is supplemented by an unusually large number of excellent illustrations, (348). All basic points are graphically illustrated in a way that creates additional interest for the reader and assists him to gain a full understanding.

Numerous example problems are given along with a step by step solution. Each chapter is followed by a good group of questions.

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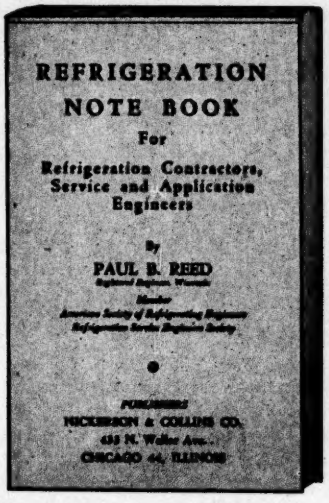
Circle No. 45 on Reader Service Card

A Vest Pocket Book of Valuable Data

REFRIGERATION NOTE BOOK

by PAUL B. REED



Vest Pocket Size—3¼ x 5 inches
204 Pages—Flexible Binding

THIS NOTE BOOK of condensed refrigeration information represents many years of work in accumulating practical data—"culling out" all extraneous material—so as the author states, "the reader will find a handy and easily carried source of information not usually kept in memory."

You will be surprised at the wealth of material that has been included in this convenient and practical reference Note Book. It is written in layman's language, without complicated formulas. In short, it is a tool responsible for the operation of refrigeration equipment.

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ICE PLANTS—WANTED & for sale

FOR SALE—Complete 65 ton ice plant served by two railroads. Brick and masonry building 16,500 sq. ft. Three cork lined ice storages suitable for freezer storage. 2 Fairbanks Morse Diesels 150 h.p. each; 2 Vilter compressors; 2 freezing tanks. Coal yard and equipment—feed business and other lines. Corp. has tax advantages. Will sell entire business or machinery separately. Located in Decatur, Ill., expected to be 100,000 pop. in three years. Consumers Ice & Coal Co., 701 N. VanDyke, Decatur, Ill.

FOR SALE—Ice plant situated on highway 61-67 at Festus, Missouri; in a growing community. 80 tons refrigeration; two Yorks and one Frick ice machines; 360-300# ice tank with ample storage for 2000 blocks of ice; two Fairbanks-Morse, 140 h.p. each, needle bearing engines. Two ice vending stations, and one at plant, just recently installed. Fully equipped. Selling entire output of ice. DeSoto Dairy Ice & Supply Co., DeSoto, Mo.

FOR SALE—30 ton York trunk type complete ice making plant, Diesel drive. 7¼x7½ high York with motor; 7½x7½ slow speed York with motor. 6x6 Frick high speed. 9x9 with synchronous motor; 9x9 slow speed; 12x12 with synchronous motor; self-contained units. Ice cans, brine coolers, condensers, agitators, cranes, blowers. Parke Pettegrew & Son Co. 370 W. Broad St., Columbus 8, Ohio.

FOR SALE—20 ton electric driven ice plant, located in heart richest county New Mexico. Exclusive sales 20,000 population. Plant and equipment in excellent condition. One 9x9, one 5x5 compressors. 3 delivery trucks. Low power and rent rates. $15,000 complete; terms if desired. Ideal climate in heart of hunting and fishing country. Address Box 638, Lordsburg, New Mexico—Phone 31.

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20 tons to 150 tons.
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FOR SALE—Troy 9"x9" steam engine; Frick 7"x7" compressor, steam driven; 2 brine pumps, steam driven. All in excellent condition. Contact Chief Engineer, West Jersey Hospital, Camden, N. J.

FOR SALE—Voss ammonia compressors, complete, good condition. Two 5 ton and one 6 ton. Contact Plymouth Rock Provision Co. Inc., 1560 Boone Ave., Bronx 60, N. Y.

FOR SALE—4 Frick ammonia compressors. 4 units, total capacity approx. 190 tons, with 2—185 h.p. synchronous motors; good condition; absolutely a close-out sale; your inquiries invited. Write Box NV-4, c/o Industrial Refrigeration.

FOR SALE—9" x 9" Frick compressor, high speed, FF lubrication—completely rebuilt. 36" x 15' vertical condenser, 140-2" tubes. 30" x 16' vertical condenser, 92-2" tubes. Both retubed since used. 36" x 16' horizontal 8-pass 136-2" tubes. 46" x 15', 220-2" tubes, 10-pass. Both excellent condition. Also 30" x 16' receiver. Box SP-12, Industrial Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

FOR SALE—10"x7" Worthington booster compressor. 4x4, 5x5 Fricks. 3x3 York self-contained. 7½x7½, 8x8, 9x9 Yorks, splash lubrication. Receivers, all sizes. 10x10 Frick direct connected to Superior Diesel engine, 257 r.p.m., 15 h.p., Freon compressor and motor. Write E. Niebling, 1546 St. Clair, Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—Recently rebuilt Vilter 7½x7½ compressor, complete with rebuilt G.E. 40 h.p. 3/60/220 volt induction motor, Cutler-Hammer switches and controls, forced feed lubrication. York ammonia condensor 12" O.D.x16' long, Natl.Bd. #205, YIM Corp. W.P. 250, U 69, 1935 H.S.B. 4540, Serial #205. York receiver, 12"O.D.x16' long, Natl. Bd. #84, YIM Corp. W.P. 200, Class #2, 1933, H.S.B. 40816. Will sacrifice for quick sale as a lot or as individual items. Address Box NV-6, c/o Industrial Refrigeration.

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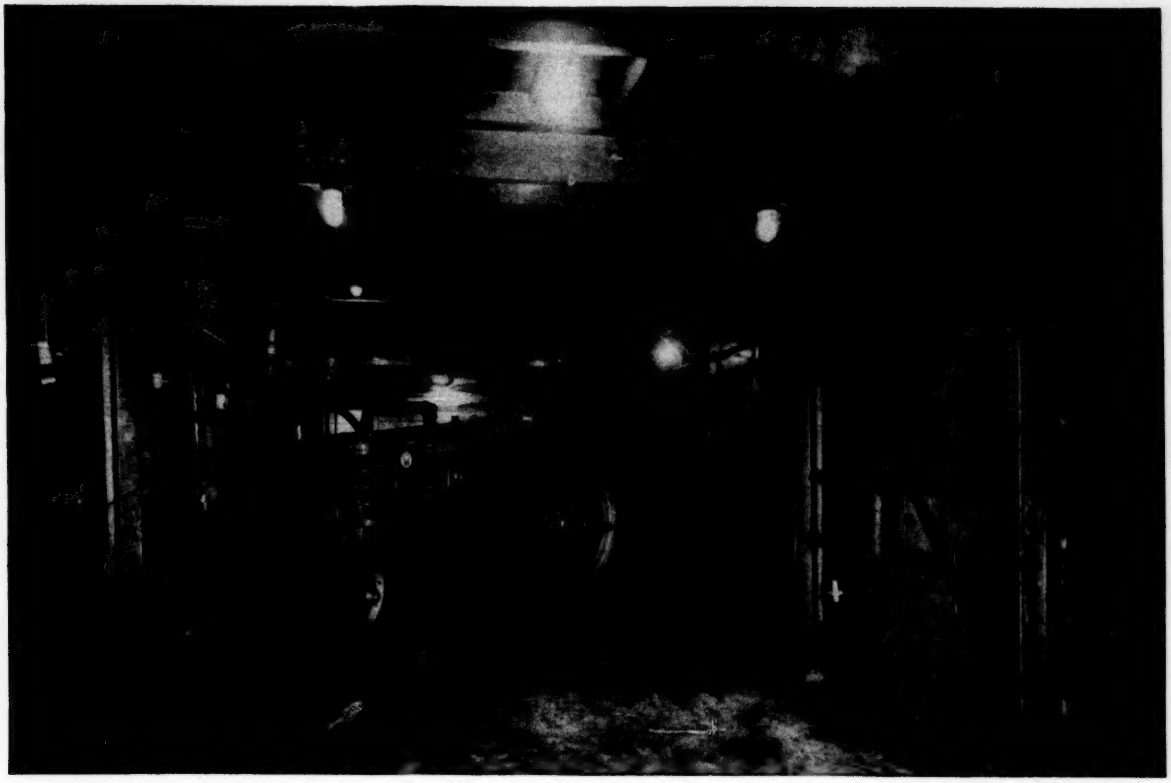

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For temperatures from 300° below zero to 2800° F.

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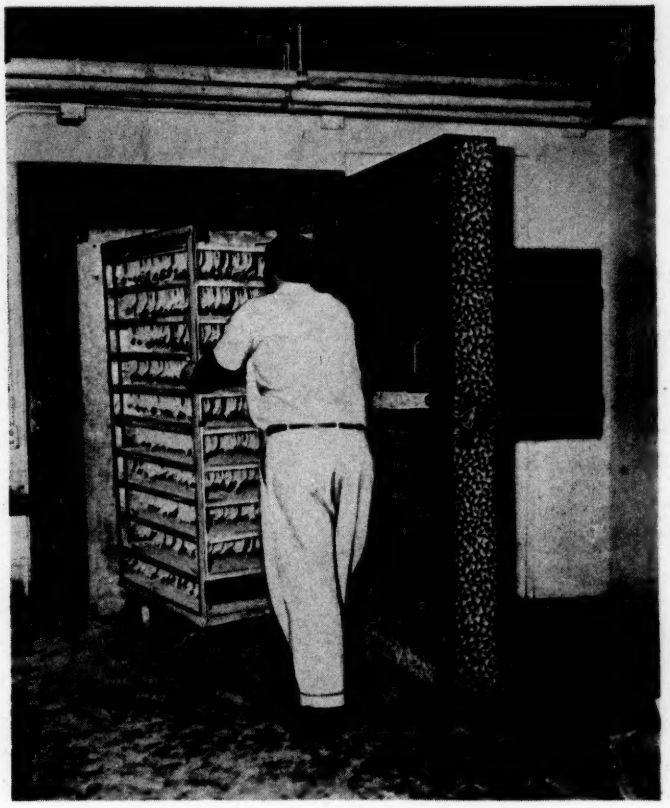
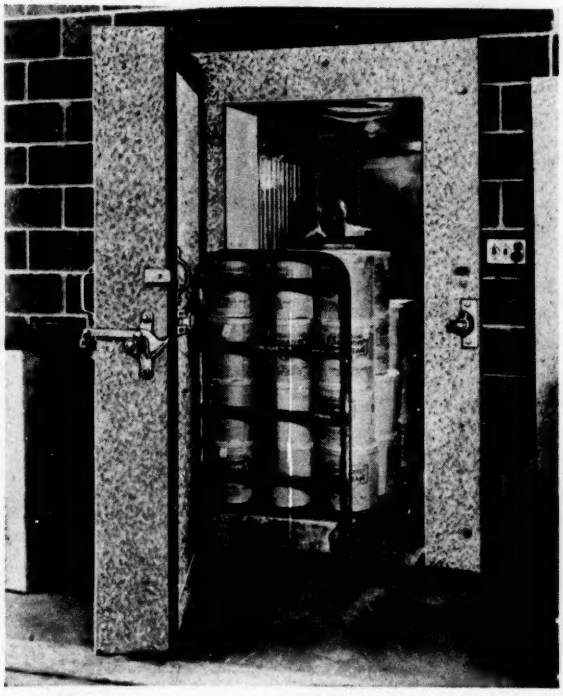
From Appetizers to Desserts Foods Freeze and Keep Better in Freezers with JAMISON Doors



Shrimp freezes f-a-s-t — keeps fresh in a freezer with a JAMISON Super Freezer Door.



You may not be freezing shrimp—or hardening ice cream—but if you must maintain temperatures as low as -40°F your best bet is a JAMISON Super Freezer Door. Check with your engineer or architect and for more information, specifications, and dimensions write Jamison Cold Storage Door Company, Hagerstown, Maryland, U.S.A.

In Ice Cream hardening rooms constant temperatures and low refrigeration loss are *musts* and that's why most engineers recommend JAMISON Super Freezer Doors.

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